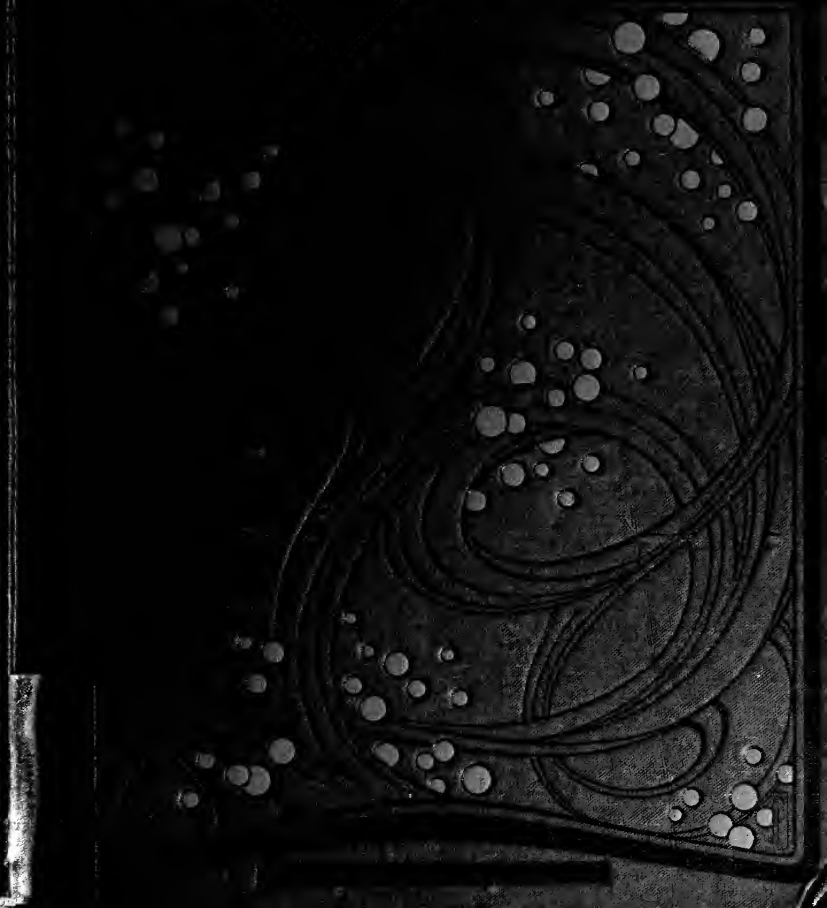
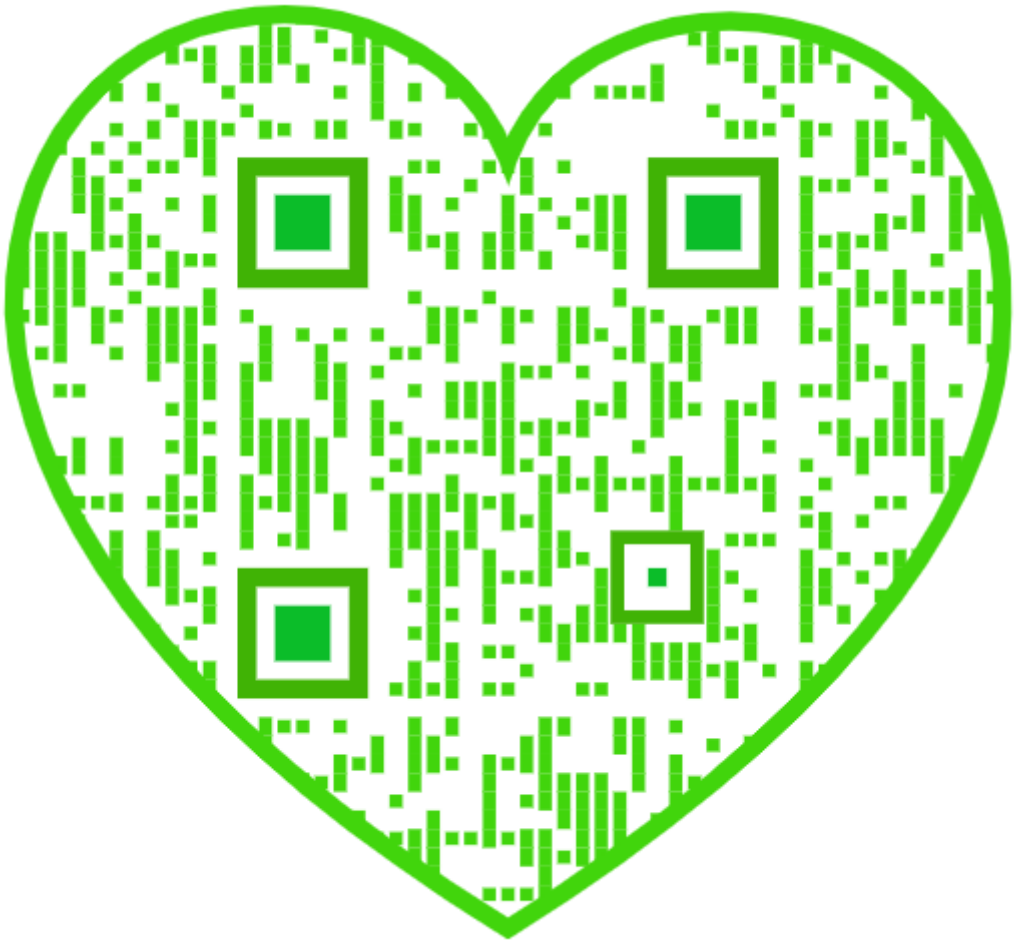
THE HORSE

ITS TREATMENT IN HEALTH & DISEASE





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THE HORSE

ITS TREATMENT IN HEALTH AND DISEASE

CHAMPION SHIRE MARE, ROKEBY FUCHSIA

Winner of Numerous Prizes

ITS TREATMENT IN HEALTH AND DISEASE

WITH A COMPLETE GUIDE TO BREEDING
TRAINING AND MANAGEMENT

Edited by

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"Examination of Horses as to Soundness" "Glanders, its Spread and Suppression" "Swine Fever
"Lithotomy or the Removal of Stone from the Bladder of the Horse"

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The Exmoor.—The Exmoor pony, like the Dartmoor, should not exceed 13 hands at the shoulder, even if he reaches that height, a fact that is rather remarkable, for Exmoor is better supplied with nourishing keep than Dartmoor. There is also a sort of glamour of romance in connection with the Exmoor, as the stories of the mysterious Katerfelto—the dun stallion which appeared upon the scene, from where no one appears ever to have discovered—have been the thesis adopted by other writers besides the great Whyte Melville, and to the public the mysterious is nearly always attractive. Some sceptics asserted that there was never such an animal as Katerfelto; but they were wrong, for he was eventually secured, and while in captivity served several mares. Mr. G. S. Lowe, who investigated his history upon the spot, asserts that he was a dun horse with a black list down his back, and that his appearance was that of a blood-like cob. Suffice it to say, that Katerfelto was no myth, and that his mysterious appearance may probably be due to the fact that he had survived some shipwreck and made his way to Exmoor unnoticed, or, at all events, for a long time uncaptured by any of the inhabitants of the locality. The residents in the village of Exmoor can offer no information whatsoever concerning the origin of their ponies; all they appear to know is, that this breed has existed for a period far beyond living memory, and that the animals are most necessary to their comfort.

About the year 1820, Sir John Knight purchased some 20,000 acres of moorland, for the purpose mainly of raising ponies, and he afterwards added to his original purchase the part of the forest that belonged to Sir Thomas Acland, as well as the celebrated herd of ponies contained thereon. The original stock was subsequently crossed with the Nubian horse Dongola, the Arab, and the Thoroughbred; but he ultimately tired of pony-breeding and devoted his attention more to sheep—not, however, before the height of the Exmoor had been brought up to nearly 13 hands by the use of Thoroughbred blood.

In the year 1850, Sir Frederick Knight, who then owned Simonsbath, recommenced pony-breeding operations to a great extent, and produced some extraordinarily good-looking animals up to 13 hands, whilst several extremely beautiful specimens of Sir Thomas Acland's strain still survive. The latter have chiefly been bred by the late Sir Thomas Acland at Porloch, near Dulverton, to which place their ancestors were removed when Sir John Knight purchased Simonsbath. It is believed that shortly before his decease Sir Thomas Acland introduced some crosses, and so followed the example of Sir John Knight. If so his action is much to be regretted, as the truebred Exmoor pony had already become extremely rare, for no British pony has been a greater victim of fantastic crosses.

As regards his general appearance, the Exmoor perhaps shows more quality than the Dartmoor, his head being extremely clean and neat, his eyes full of spirit, whilst his limbs and middle piece are excellent, and they are not so frequently found cow-hocked as the Dartmoors are. They are a most valuable cross for the purpose of producing the miniature Hunter style of pony, and anyone who purposes embarking in the pleasurable pursuit of pony-breeding should congratulate himself if he succeeds in getting possession of a few mares of the old blood, for they are sure to serve him well; but, as has been stated above, the majority of so-called Exmoors are simply mongrels.

The New Forest. — As probably everyone who reads these lines is aware, the New Forest owes its existence as a royal forest to William the Conqueror; and it is pretty certain that since the days of that monarch it has been to a greater or less extent the home of horses of some shape or other. The extent of the crown property here is about 70,000 acres, and admirers of the ponies that exist in the forest are in the habit of claiming for them that they are indigenous to the locality; but whether this is the case or not, it can scarcely be claimed for the present representatives of the ancient race that they appear to have repaid the care that has been bestowed upon them. So far back as the middle of the eighteenth century the famous Marske, the sire of Eclipse, was covering mares in the neighbourhood of the forest at a half-guinea fee, whilst in more recent days the services of Arab stallions have been available through the good offices of the late Prince Consort, and no doubt the large number of grays that are met with in the district strain back to the latter horses. Still, in spite of the advantages it has received, the New Forest pony of the present day is in appearance beneath the level of the Dartmoor or the Exmoor, as it fails to equal these varieties both in head and shoulders, added to which it is often badly goose-rumped; but it possesses plenty of courage and dash, and makes an excellent trapper, so there is reason to believe that the exertions which are being made to improve the breed will be crowned by excellent results. At present there is an association in existence for the purpose of improving the variety; but though the writer made enquiries and asked for information concerning it, no reply was received, and consequently it is but reasonable to infer that no tangible results have hitherto been attained by the promoters thereof.

The Welsh.—The true Welsh pony, and especially if he is a creditable representative of his race, is one of the best and most serviceable animals that could be desired. The worst thing that can be said about him is that the Welsh pony has been so carelessly bred that a variety of types exist to confuse the public mind. As a rule, the Welsh pony runs rather taller

than the varieties referred to above, for it is not often that a really good-looking one stands much under 13 hands, and there are a great many over that height. Still, as it is not everyone that requires a very small pony, this may be regarded as a qualification in favour of the Welshman by many persons; and at all events there is no denying the fact that these animals have not only fully maintained their hold upon the affections of the public, but have deserved it. The best specimens very closely approach the miniature Hunter type, which may be laid down as the most generally accepted ideal for the all-round pony; but many of them lack the quality that the introduction of Thoroughbred blood always brings, though the Welshman is grand material to work upon. He is generally a very free and fast mover, with plenty of action, and his legs and feet are exceptionally good, soundness being one of his notable attributes—in fact so much so that, as far back as the year 1842, Nimrod in his book alluded to the Welshmen as never going lame in their feet or becoming roarers.

Roughly speaking, though the Welsh pony and cob are not always so blood-like in the head as some breeds, they are by no means coarse there; they are very good about the shoulders, the back is short and strong, and the quarters, if sometimes plain, are as a rule superior to those of many other varieties. The Welsh pony also has a society devoted to his interest and improvement, and, like the Exmoor, may be dismissed with the observation that, however valuable he may be for the beginner to commence with, it is probable that if the object of the breeder is to produce 12-hand ponies, he may experience some difficulty in making his enterprise a success.

The Westmoreland. — Sir Walter Gilbey, Bart., in his extremely interesting article on the subject of ponies, which appears in the *Live Stock Journal Almanack for 1896*, makes the statement that the moors and waste lands of Westmoreland and Cumberland have for centuries been used for breeding ponies, horses, and Galloways. Such being the case, it is remarkable to think how little the Westmoreland pony is really known; for although the presence of valuable ponies in the north has never been doubted, it was not known to everybody that the district has been the home of such animals for centuries. It is, however, extremely probable that the fame of Mr. C. W. Wilson's strain, which hail from Kirkby-Lonsdale, has of recent years so completely overshadowed all the other ponies in the district, that the latter have become lost sight of. No doubt Mr. Wilson found some of his foundation stock in that locality, but he, it may be observed, so improved them by judicious inbreeding and a scientific attention to the details of out crosses, that no

better ponies can exist, and consequently diligent search should be made by intending breeders in the neighbourhood whence the Wilson ponies came.

The Shetland.—There is not much to be written about the Shetland pony that is not generally known, but it is satisfactory to be able to assert that these useful little horses are making steady headway in the south of England. Possibly the Shetland is the only variety of the equine race of which specimens can be found that possess the blood of no outside cross, and it is upon the sterile moors of Shetland that this pony can be found in all its native purity. Beyond all doubt the inclemency of the climate and the poverty of the fare to which he and his ancestors have been subjected are responsible not only for the diminutive proportions of the Shetland, but for the robustness of his constitution, for no animal unless absolutely sound could exist and propagate his species amidst the hardships which have been the daily lot of the Shetland for generations. He is a sturdy, cloddy-built little animal, standing about 10 hands at the shoulder, though of course both taller and smaller specimens are to be met with in plenty, and no doubt owing to climate influences the coat of the Shetland is extremely dense. For his inches he is a marvel of strength and activity, which properties have rendered the Shetland's services invaluable in coal-mines, where the exertions of undersized animals possessed of plenty of power are most useful in bringing coal to the bottom of the shaft. This variety is being a good deal benefited by the Shetland Pony Stud-book Society, which is doing good work by interesting the public in the breed; but the inherent good qualities of the Shetland will always ensure his finding friends in all parts where his merits become properly understood, his docility and intelligence rendering him a very useful animal for the purposes of juvenile equestrians.

The Irish.—The Irish ponies can scarcely be accepted as being indigenous to the Emerald Isle, as, though they chiefly come from the Galway districts, any originality of type which they may have once possessed has become so defaced by the various crosses which the breed has been subjected to that it has quite disappeared. Some enthusiasts hold that the original ponies were rescued from the wrecks of the Spanish Armada, but there is no real authority for the belief. The most famous of them are the Connemara ponies, a long, low, heavy-boned, very useful type of pony. In colour they are usually chestnut, and they run from about 14 hands upwards. As a rule they are excellent workers, but as foundation stock for commencing breeding operations upon, the Irish pony as a race scarcely possesses enough of a pronounced type to be recommended, though beyond all question the introduction of a number of

small-sized stallions of good quality into Ireland is calculated to effect a very great improvement in both their appearance and value.

The Dale or Fell Pony.—This pony is doubtless a very close relation of the Westmoreland tap-root, if not identically the same animal, and also resembles the Rum pony in its conformation, so that the description given of the latter may be taken as applying equally to the subject of this chapter, though the Dale pony is, generally speaking, rather the more breedy-looking animal of the two. At the same time, it is difficult to believe that there is not some intimate relationship between them, though doubtless the Dales have received more attention from north-country breeders than have the Rum ponies from the Scotsmen of the west coast. A very great recommendation of the Dale pony is his great stamina, as some members of the variety are credited with having travelled immense distances under heavy burdens; whilst the strength of their constitutions is borne evidence to by the fact that they exist and flourish on the hills on the borders of England and Scotland under conditions which would render existence impossible in the case of most horses. Like the Rum pony, the Dale pony is extremely sure-footed, and being as it were a sort of half-way breed between the horse and the pony, the Fells should prove acceptable additions to the establishments of those who desire to possess a sturdy, useful animal of rather less stature than the ordinary cob. Finally, as a proof of the antiquity and stamina of the English north-country pony, it may be stated that an account is in existence of a Mr. Sinclair of Kirkby-Lonsdale having, for a wager of 500 guineas, ridden a Galloway 1000 miles in 1000 hours at Carlisle in the year 1701, the Galloway being presumably a Fell pony.

The Rum Pony.—The association of the above name with a well-known breed of ponies inhabiting the north and west of Scotland has become of late years an accomplished fact, owing to the fact that almost all the best specimens have been bred on the isle of Rum, whilst those on the mainland have become deteriorated in quality. The former circumstance is doubtless owing to the fact that so far back as the year 1847 a former Lord Salisbury turned a Thoroughbred stallion out on the island; but unhappily no authentic records of the ultimate fate of the horse or of the produce of his sons and daughters have been forthcoming. At a comparatively recent period, however, Lord Arthur Cecil purchased the entire stock of island ponies, and removed them to the neighbourhood of the New Forest, where doubtless their improvement will be studied with ultimate benefit to the breed.

The Rum pony is usually black in colour, and the average height is between 13 hands 2 inches to 14 hands 3 inches, which proves that

they are considerably taller animals than the ordinary run of English pony. As a rule, their shoulders are good, and their feet and legs are the perfection of soundness. On the other hand, although rather narrow in their build, their heads incline to coarseness. Lord Arthur Cecil claims for them that the main characteristics of the breed are extreme docility when broken in, immense strength, and great intelligence, all of which merits, combined with iron constitutions, have been preserved by the specimens of the Rum pony which have come beneath the notice of the writer.

The Hackney Pony.—The Hackney pony, now unquestionably an established breed, is a most valuable little animal, not only on account of his intrinsic merits, but because of the great success which usually attends the crossing of him with the mares of other pony breeds. As a variety but little need be said of him here, since in character and make-up he is simply a pocket edition of the ordinary Hackney, which by judicious selection has been bred down to the desired height by pony lovers, who have wanted to possess an animal of about 14 hands which will excel in action and possess all the good looks of the larger members of the breed. With the possible exception of the Wilson ponies—which have had more judicious care expended upon them for a longer period, and which owe by far the largest proportion of their excellence to the strong dash of Hackney blood which is inbred in their veins through Sir George—the Hackney ponies are the most valuable and generally high-priced of all the varieties of equine bantams, and for harness purposes, in cases where high action is desired, there are no animals of their inches which can approach them in style, symmetry, and action. Consequently it is not surprising to find their numbers increasing on all sides.

No doubt Sir George, the stallion from which the Wilson pony sprang, is likely to be accepted as the most successful member of the breed which has appeared, his long sequence of victories at the Royal Agricultural Society's shows providing the strongest testimony to his good looks and action and quality. Sir Horace, by Little Wonder, for which Sir Gilbert Greenall was content to pay 500 guineas, is another Hackney pony whose name will long be a household word amongst breeders, as will that of Mr. J. Jones's Cassius; whilst included in the category of famous little horses of the variety is Pick Up, by Model, a winner of the early shows of the Hackney Horse Society, which was purchased to run in the New Forest. All these animals will be remembered as being first-rate Hackney pony stallions.

The Wilson Pony.—This variety, which only exists in small numbers, owing to the fact that its origin is comparatively a matter of recent

date, is founded upon a long-sustained cross of the Hackney upon the Fell pony. Mr. C. W. Wilson, of Kirkby-Lonsdale, to whom is due the entire credit of its production, founded his stud by selecting a number of high-class Cumberland mares and crossing them with the Hackney pony stallion Sir George, which possessed a strong dash of Norfolk blood. The fillies from this cross were put to their sire, and in most cases this was repeated for another generation, with the most remarkably successful results; for although the height was well kept down to under 14 hands, the bone and stamina of the strain was fully maintained, whilst their beautiful quality and action made them popular from the first. A proof of this is forthcoming from the fact that at Sir H. de Trafford's sale by auction in Norfolk in September, 1895, five Wilson pony mares were disposed of at an average of over 700 guineas each, the highest price of the day being obtained by a three-year-old filly, which realized 900 guineas: this youngster being the most inbred of the lot.

In appearance the Wilson pony may be described as being a high-class miniature Hunter, gifted in most cases with superlative action, and an amount of quality which is surprising even in the case of so small an animal. In colour they are usually bay, and it may be added that the originator of the family, Sir George, was a winner at the annual show of the Royal Agricultural Society of England upon no fewer than eight occasions.

The following were some of the Wilson ponies disposed of at the sale referred to above:—

Snorer II, 8 years	600	guineas.
Foal, Snorer IV	65	
Georgina	300	,,
Dorothy Derby, 5 years	600	,,
New foal, Agnes Derby	105	,,
Dorothy Derby II . . .	720	,,
Snorter II	700	,,
Jackdaw, 2 years	150	,,
Miss Sniff, 3 years . .	900	,,
Julius Cæsar, 1 year . . .	210	,,
Roman Warrior, 2 years	155	,,
Snorter, 3 years	350	,,
Young Sir George, 9 years	100	,,

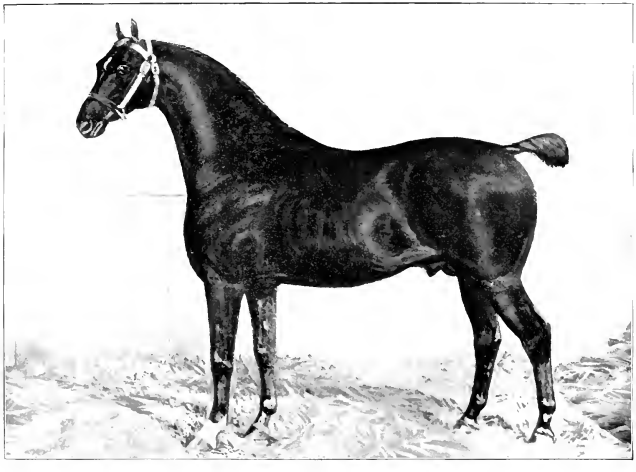
The most famous of the mares of the family, so far as the show ring is concerned, are Snorer, the original, so named because of the singular noise she made in her nostrils, Dorothy Derby, and Dorothy Derby II, all of which have won prizes at the most important shows; whilst the names of others have appeared prominently in many an exhibition catalogue.

HEAVY HORSES

The Shire Horse.—The subject of the present article is entitled to be accepted as the giant of the equine world, and possibly no variety of English horse impresses foreign visitors to an agricultural show more than do the majestic animals which within the last few years have come to be included in the category of the Shire horse. Previously to a decision being arrived at amongst breeders to abandon such designations as Cart-horse and Agricultural horse, some confusion naturally existed in the minds of inexperienced persons who frequented horse shows as to the classification of our heavy breeds, and consequently the fusion of all heavy English horses—of accredited pedigree—save Suffolks, into one division has been welcomed by the public, and no doubt the animals themselves have been benefited by it.

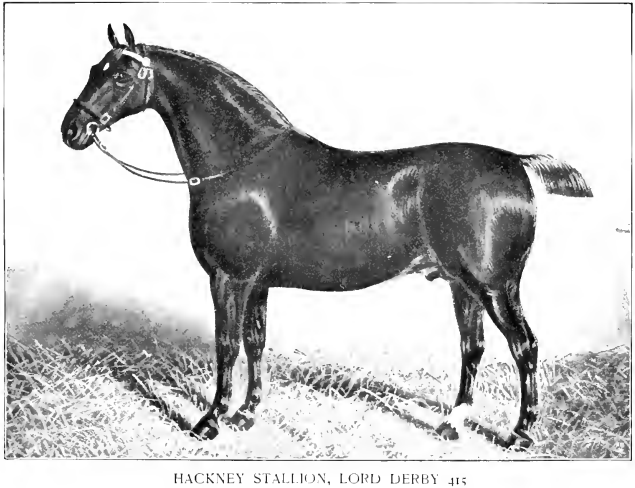
Accepting, therefore, the Shire horse as the modern representative of the English draught horse, the searcher after earlier records of his existence will at once discover that the variety possesses the distinction of being a very ancient one indeed. Sir Walter Gilbey, in his most interesting work on the old English War-horse, maintains, and with a very considerable amount of success, that the Shire is a direct descendant of that celebrated animal of which the ancient Britons were so proud, and their Roman conquerors were so extremely covetous. Still, whether Sir Walter Gilbey is fully justified in his deductions or not—and he writes with authority, since no one man has done more for the advancement of the Shire horse than he—the fact remains that there was an ancient breed of horses in Great Britain at the time of the Roman invasion, and that the animals were then considered remarkable for their size and power, though of course vastly inferior in stature to the Shire horse of the present day. There is no doubt at all, as history shows, that the old strain of horses was highly prized by successive kings of England who flourished since the Conquest, this fact being clearly proved by the references that have already been made to the good deeds, from a horse-breeder's point of view, of the different English monarchs.

It is equally certain, also, that in the earlier stages of their respective efforts to improve their race of horses, the sovereigns of England were more influenced by a desire to produce a superior type of War-horse than to assist mere peaceable agriculturists in preparing their land for cultivation. As a matter of fact, all the necessary farm-work, which in those days must have been terribly heavy, was performed for centuries by oxen, the few horses that were employed for what was considered to be a somewhat degrading



HACKNEY STALLION, CONFIDENCE, D'OYLEY'S 153

By Pinkwillow 614; dam by Highflyer 309 by Flying Buck 288. A famous hackney sire.



HACKNEY STALLION, LORD DERBY 415

By Performer 450; dam by Joseph Andrews (Leeds) 3. A famous hackney sire.

task being known by the designation of *stots* or *offers*. A peculiarity in connection with the former of these titles is, that it is a term applied to oxen in certain parts of Scotland, and perhaps it points to the association of the old draught bullocks with horses used for farm-work.

William the Conqueror was the first king of England who attempted to produce a horse specially adapted for agricultural purposes; and so far as can be ascertained, the first notice of a horse being so employed was published in the first year of this sovereign's reign. It consisted of the delineation of a horse attached to a barrow and attended by a man. The figures were woven in a piece of Bayeux tapestry, which has served as a landmark to proclaim and fix an approximate date for the introduction of horses into the operations of the husbandmen, and is therefore historically important. Henry II was the next monarch of England who appears to have made serious efforts to improve the race that was then known as "the Great Horse". In his reign sires were imported from abroad. John, whatever his other failings may have been, developed a genuine interest in horse-breeding, as evidence of which he imported one hundred large-sized stallions from Flanders and Holland for the purpose of crossing with the native mares. Edward II evidently possessed a hankering after both light and heavy horses, for he is credited with having imported thirty Lombardy war-horses and a dozen big draught stallions for breeding purposes; whilst Edward III, working on different lines, added his quota to the efforts of his predecessors by deciding to keep all the best animals in the country, which end he accomplished by prohibiting the exportation of any horses at all.

Then there appears to have been a lull in the enthusiasm of the English kings in the matters of horse-breeding, until that monarch of decided views, Henry VIII, undertook to grapple seriously and practically with the question of undersized animals, though Henry VII may be credited with having attempted something by reviving the exportation laws. Bluff King Hal, however, when he once determined to see into the matter, lost no time in setting to work with characteristic energy. Only mares and stallions above a certain height were allowed to be bred from, and the wealthy prelates and nobles, whose wives indulged in such expensive luxuries as French hoods or velvet bonnets, were compelled to keep stallions of a stipulated size for the benefit of the community. Satisfied with the improvement that his earlier laws had effected in the race of English horses, King Henry, in 1535, caused another edict to be passed, which provided that all owners or farmers of parks and enclosed ground of the extent of 1 mile in compass should keep two mares apt and able to bear foals, of the altitude of 13 hands

at least, under a penalty of forty shillings. A like penalty was also inflicted upon any owner or farmer who willingly permitted such mares to be served by a stallion under 14 hands. Still later on, in the year 1541, it was enacted that no horse under 15 hands should be allowed to run in certain forests and districts. This is specially interesting to the modern Shire horsebreeder, as the expression "Shire" is referred to in the Act—not, it is true, in connection with the animal, but with the districts in which stallions under 15 hands were to be permitted to run loose on moors and in forests. The districts were Norfolk, Suffolk, Essex, Cambridge, Huntingdon, Buckingham, Berkshire, Oxford, Worcester, Herefordshire, Gloucester, Somerset, South Wales, Warwick, Northampton, Cheshire, Staffordshire, Shropshire, Leicester, Lincolnshire, Lancashire, Yorkshire, Kent, South Hampshire, and North Wiltshire. Not only were these stringent provisions made for ensuring the services of desirable stallions, but legislation was directed also towards mares, filly foals, and even geldings, which did not appear likely either to grow or to be able to bear foals of reasonable stature, or not likely to be able to do "profitable labours by the discretion of the drivers". In such cases the driver or drivers were compelled by the Act to cause the unprofitable beasts to be killed, and their bodies to be buried in the ground or "otherwise bestowed as no annoyance thereby shall come or grow to the people there near inhabiting or thither resorting". Subsequently, the laws already in existence prohibiting the exportation of horses were extended to Scotland, so that any person discovered selling horses to a Scotsman, and the purchaser as well, rendered themselves guilty of the act of felony. That the vigorous policy of King Henry worked well there can be little doubt—a statement made by Sir Thomas Chaloner in the reign of Queen Elizabeth, assists to prove this—for there is every reason to suppose that his subjects, knowing the determined disposition of their monarch, and his peculiar methods of enforcing obedience to his will, acted up to the strict letter of the law in every particular. Finally, it may be added as a testimony to King Henry's sincerity in his desire to improve the heavy horse, that Ralph Holinshed states that he "erected a noble studderie for breeding horses, especially the greatest sort, and for a time had verie good success with them".

To King Henry VIII, therefore, the present Shire horse is indebted for a good deal of the size and power it possesses; but in spite of the improvements brought about by the active policy of that much-married monarch, the English animals, even at the conclusion of his reign, were not as a rule equal in stature to the horses of the Continent. This is borne testimony to by the writer last quoted, who, in alluding to the

position of the equine race in this country in the days of Queen Elizabeth, expresses himself as follows: "Our horsses moreover are high, and although not commonlie of such greatnesse as in other places of the maine, yet if you respect the esinesse of their pase it is hard to saie where their like are to be had. Our cart or plough horses (for we use them indifferently) are commonlie so strong that five or six of them (at most) will draw three thousand weight of the greatest tale with ease for a long journie, although it used to be not a load of common usage—which consisted onlie of two thousand, or fiftie foot of timber, fortie bushels of white salt, or six and thirtie of bail, or five quarters of wheat—experience dailie teacheth, and (as) I have elsewhere remembered. Such as are kept for burden will carie four hundred weight commonlie, without any hurt or hindrance." An ability to move about under such a weight must have been thought a *sine qua non* in the case of the charger of the period, for, as Sir Walter Gilbey has pointed out, the armour carried by horse and man about that period must have scaled quite that amount. As an instance, there is the armour which is credibly believed to have belonged to the Duke of Suffolk, one of the numerous brothers-in-law of King Henry VIII, now lying on view in the museum of the Tower of London, the weight of the various portions being as follows: man's armour, 99 lbs. 9 ozs.; horse's armour, 80 lbs. 15 ozs., which, added to the weight of the rider and his accoutrements, would have brought the figures up to very nearly if not quite the amount alluded to by Holinshed as being the ordinary burden for the charger of the Elizabethan era.

Some extremely interesting allusions are contained in the book published by Thomas Blundeville of Newton Flotman, Norfolk, in 1566, as the author was evidently a practical judge of horses, and succeeded in collecting for his work a good deal of very useful information to lay before the readers of his *Breeding of Horses and Art of Riding*. As may naturally be expected, the "Great Horse" occupied a good deal of his attention, and he commences by referring to the fact that "some men have a breed of Great-Horses meete for the war and to serve on the field". This breed Blundeville describes as "though not finely, yet strongly made, he is of great stature", and he offers some interesting descriptions of both the Flanders and the Almaine or German heavy horses, with which he evidently associates the English animals. Blundeville commences by referring to the similarity which in many points existed between the two breeds, and then proceeds to describe their points as follows:—"The Flanders horse in his shape and disposition differeth in a maner nothinge from the Almayne horse, saving that for the most parte he is of a greater stature and more puissant. The mares also of Flanders be of a greate

stature, strong, longe, large syze and fruytefull, and besydes that wyll endure great labour as is wel sene, for that the fleminges do use none other draught, but with these mares in their wagons, in the whiche I have sene twoo or three mares to go lightly away such a burden as is almost incredible." In his description of the "German horse" Blundeville thus expresses his opinions: "The Almaine is commonly a great horse, though not finely yet very strongly made, they be very grosse and heavy, yet by industry can be made lighter behind than before. The disposition of this horse (his heavy moulde considered) is not evyll, for he is very tractable, and will labour indifferently well by the waye, but his pace for the moste part is a very harde trot." It is extremely probable that in paying his tribute of praise to the capacity of the Flemish mares Blundeville was labouring under the impression that the summit of equine perfection had very nearly been attained by these heavy animals; and there is no denying that, though their powers may appear almost contemptible in the eyes of modern Shire horse-breeders, their performances were better than they at first appear to be, as the vehicles to which they were attached must have been of ponderous weight, whilst the condition of the so-called roads was indescribably bad during that period of the world's existence.

Later on, in the reign of James I. it is recorded that when horses were required for military purposes beyond the seas, it was calculated that eight animals would have to be provided for each baggage wagon that carried a ton, and three for each ambulance conveyance that was to be supplied for carrying the wounded and invalids to places of safety. The estimated value of these horses was £9; but they were clearly regarded as being of inferior quality to the "strong or great" horses which were also alluded to. It was recommended that 200 of the latter should be purchased at the price of £15 apiece, which shows that the breeders of the bigger horses were making money out of their studs.

In the year 1667, the first Duke of Newcastle published a second edition of his work, *The Manner, and Feeding, Dressing, and Training of Horses for the Great Saddle, and Fitting them for the Field in time of War*, which had appeared in 1658. His grace appears from his writings to have been inclined to take rather a pessimistic view of the position of the English horse of the period, for he states: "There were many good races [of horses] in England, but they are all now ruined, and the many new breeders of horses come up presently after the wars are, I doubt, none of the best; for I believe their stallions were not very pure, because the men that did govern in those days were not

WHAT'S WANTED (2332).

What's Wanted was bred by Mr. J. Ashmore of Darlton, Nottinghamshire, in 1873.

He was a bay horse 17 hands high, with two white hind-legs and a broad blaze down the face. At two years old he came into the hands of Mr. James Forshaw, Carlton-on-Trent, Newark, in whose stud he continued to the time of his death in 1882. He had for his sire Bold Lincoln, 231, and his dam Diamond was by Oxford, 1683.

At three years old he had sired that good mare Sunshine (Shaw's), and each succeeding year his stock occupied a more conspicuous and prominent position in the prize-ring.

Premier, 2646, his most distinguished son, not only took high honours at the best horse exhibitions in the country, but he proved himself one of the most successful sires of his day, following closely in the wake of his stable companion Harold.

Besides Premier, What's Wanted sired a large number of noted horses, and established a strain, the blood of which is to be found in most of our best shire stock.

Among his best sons may be mentioned Bold Lincoln, 2536; Northern King, 2635; Silent James, 2668; Eclipse, 2571; Old Times, 2861; Union Jack, 2684; Benefactor, 2394; Trade Mark, 2940; Blyth Echo, 2991; Duke of Lancaster, 2566; Candidate 2405; and Royal Stamp 3296.

He had more good daughters than sons, and of the best were Princess Alice, Reciprocity, Brock, Shire Queen, Sunshine, Flower Girl, Maggie (Foxwell's), Lassie, Lady Whitelock, Shire Maggie, &c. &c.

He died when only nine years old, and at a time when still greater success might have been expected from his services at the stud.

WHAT'S W

DIAMOND

Oxford, 1683

2nd Dam

Honest Tom, 1060

Brown Horse
(Milton & Colley's)

Drayman, 807

Farmer's Glory, 816

Magnum Bonum, 1444

King of the Country, 1225

Magnum Bonum, 1444

6th Dam

Phenomenon, 1711

7th Dam

Black Prince, 167

Fisher's Black Horse of Weston

John Bull (Bradley's)

Black Prince, 166

Diamond by Black Prince, 152

King of the Country, 1226

Thumper, 2113

4th Dam

5th Dam

Horse 1072

6th Dam

Honest Tom, 1073

Magnum Bonum (Marshall's)

7th Dam

Thumper, 2112

7th Dam

Honest Tom, 1067

John Bull, 1160

John Bull (Bradley's)

Bellingham (Bradley's)

England's Glory, 705

BOLD LINCOLN, 231

Matchless Junior, 1544

Bounce

Farmer's Pride (Hereford)

Farmer's Pride 87?

Arthur, 24

Matchless, 1586

Matchless, 1588

Lincoln 1755

Lincoln Lad (Hereford)

Hereford, HC-

Hereford Trim, 1871

Hereford Trim, 1881

Hereford Trim, 1901

Hereford Trim (Continued)

Hereford Trim, 1911

Hereford Trim, 1913

Hereford Trim, 1917

Hereford Trim, 1919

Hereford Trim, 1921

Hereford Trim, 1923

Hereford Trim, 1925

Hereford Trim, 1927

Hereford Trim, 1929

Hereford Trim, 1931

Hereford Trim, 1933

Hereford Trim, 1935

Hereford Trim, 1937

Hereford Trim, 1939

Hereford Trim, 1941

Hereford Trim,

ROYAL ALBERT, 1881

DAM

Royal Albert, 1881

Abraham Newland, 10

Abraham Newland, 8

4th Dam

Waxwork (Grey's)

2nd Dam

4th Dam

Farmer's Glory, 821

Samson (Bingham's)

K. 1191

B (Bakewell's)

6th Dam

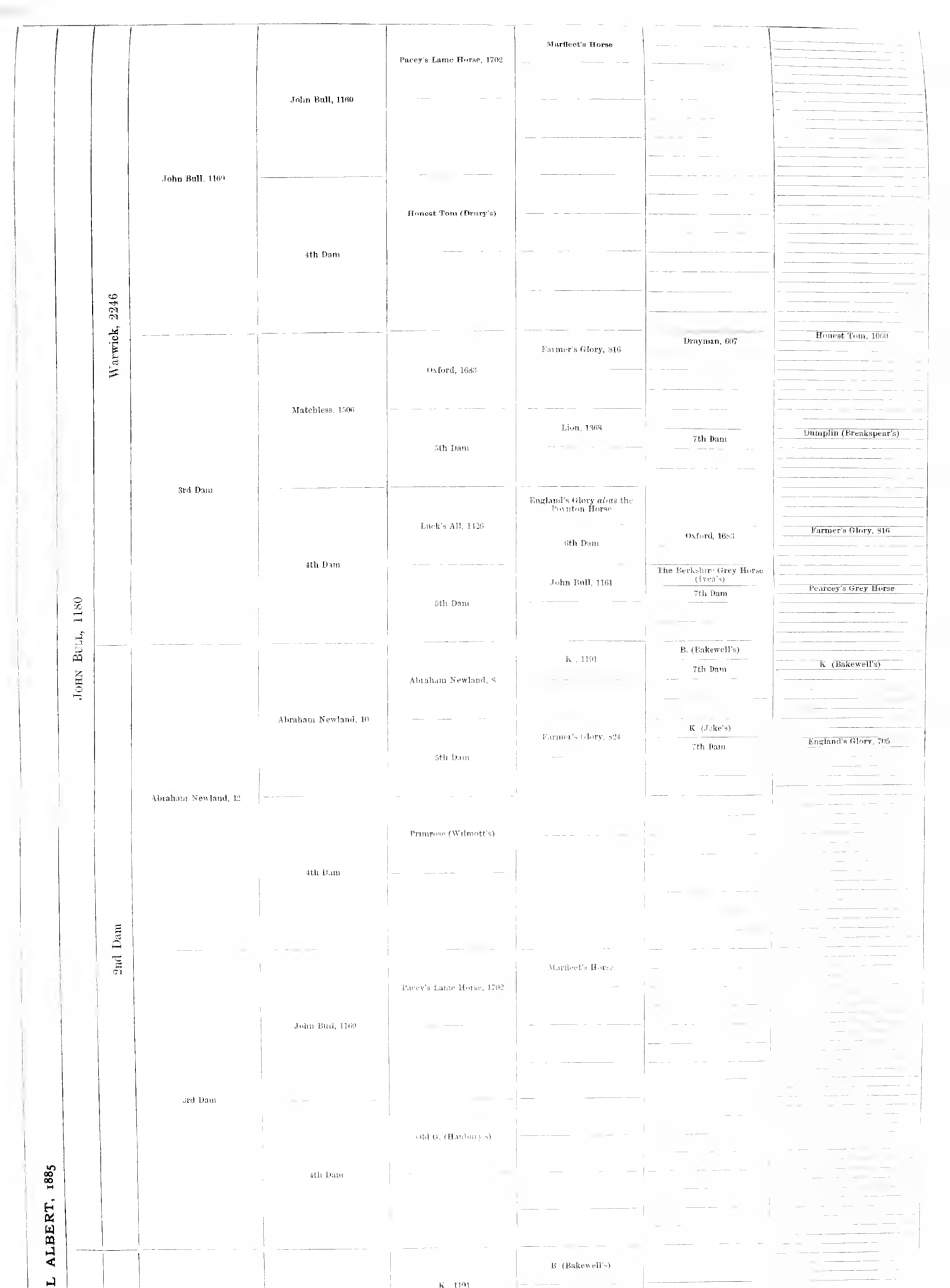
K (Jake's)

6th Dam

K. (Bakewell's)

England's Glory, 705

Honest Tom, 1040


L ALBERT, 1885
JOHN BULL, 1180
Warwick, 2246
2nd Dam
3rd Dam
4th Dam
5th Dam
6th Dam
7th Dam
8th Dam
John Bull, 1160
Abraham Newland, 12
Abraham Newland, 10
Abraham Newland, 8
Matchless, 1506
Oxford, 1683
Lick's All, 1126
Princess (Wilmott's)
Pacey's Lame Horse, 1702
Honest Tom (Drury's)
Old G. (Hanbury's)
K., 1191
B. (Bakewell's)
Marlfleet's Horse
Farmer's Glory, 816
Lion, 1303
England's Glory alias the Downton Horse
John Bull, 1161
Farmer's Glory, 824
Drayman, 607
7th Dam
Oxford, 1683
The Berkshire Grey Horse (Ivet's)
7th Dam
B. (Bakewell's)
7th Dam
K. (Jake's)
7th Dam
Honest Tom, 1660
Dumplin (Frenkspear's)
Farmer's Glory, 816
Pearcey's Grey Horse
K. (Bakewell's)
England's Glory, 705

ROYAL ALBERT (1885).

Royal Albert was a rich brown horse standing 17 hands 2 inches, with two white hind-legs and a blaze down the face.

He was bred by Mr. C. Marsden of Hatfield, near Doncaster, in 1872, and as a foal was purchased by Mr. Walter Johnson of the same place. In 1883 he was sold to Mr. G. Naylor of Newhaven, Derbyshire, who, after travelling him one season, disposed of him to Mr. Cecil Salt of Willington, Burton-on-Trent, where he continued in service until the early part of 1890, when he died. He was a big, powerful, and commanding horse, with a lot of fine quality; somewhat narrow, perhaps, in front, but possessing a grand fore end, good feet and pasterns, and the most perfect hind-limbs. His legs were full of beautiful silky hair, and big with flat bone.

Royal Albert was by Messrs. Johnson's Young John Bull, out of a big black cart mare, whose sire was Royal Albert by Abraham Newland. He distinguished himself more at the stud than in the show ring, although as a two- and three-year-old he won several prizes, notably 1st at Thorne, 1st at Snaith, 1st and silver cup at Doncaster as the "best stallion for getting agricultural and dray horses", and a prize of £5 at the great Yorkshire show.

During the eleven years he was in Mr. Johnson's possession he served at a stud fee of £2, and finished up at Mr. Cecil Salt's, where in his later days he was well patronized at a fee of ten guineas. He left many good mares in Yorkshire, but, says Mr. Johnson, "He seems to have done better among the old-fashioned Derbyshire matrons".

It has been said that King Charming, 3166, and The Beau, 3357, were the first to bring him into prominence in 1884, but it was more particularly in the hands of Mr. Cecil Salt that he really distinguished himself as a sire. Here he got Albert Edward, 5467; Willington Roan Boy, 10,792; Fear None, 4394; Calthorpe Conqueror, 9106; Albert H, 5466; Majestic, 3208; and Dunsmore A1, 9221.

Among the many good mares which have descended from him, and distinguished themselves in the show ring and at the stud, may be mentioned Lord Ellesmere's Princess Louisa, Mr. Hanson's Flower, Mr. M'Gibbon's Bonny Jean, Lord Wantage's Forest Queen, Mr. J. Brook's Champion, and many others.

so curious as the great lords and great gentry were heretofore, neither would they be at the cost". The noble author has, however, a word of praise for English horses, for he supplements his former observations by saying of them: "There are none like them in the world to breed on, but then you must choose them fit for such horses as you would breed"—a piece of advice which must have been obvious to most of his readers. In the course of his work, the Duke of Newcastle appears to be a little hard on Blundeville upon one or two occasions, and unnecessarily so, he being particularly unfortunate in his sneer at the drawing capacity of the heavy horses, as he had evidently not taken into consideration the weight of the vehicles and the badness of the roads which have been referred to above. He denies the existence of the similarity that the earlier writer notices between the Flemish, Almaine, and English animals, and in fact appears to have written with some degree of hostility towards Blundeville, for the justification of which no good reason is forthcoming.

At a still more recent period it is related that the state coach of Queen Anne was drawn by a team of long-tailed mares of large proportions; and then there occurs another hiatus in the history of the heavy horse; though in the year 1796 an article in the *Sporting Magazine* refers to "a large and strong breed in the more fertile and luxuriant part of the island", and to the fact of there being no country that could produce their equal for strength and size, "as there are instances of single horses that are able to draw the weight of three tons". Sir Walter Gilbey notices a writer, the well-known Arthur Young, who, in describing a tour he made through England, alludes to there being only two varieties of Cart-horses as deserving attention—"the large, black, old English-born, the produce, principally, of the Shire counties in the heart of England, and the sorrel-coloured Suffolk Punch, for which the sandy tract of country near Woodleigh is famous".

Another rather important link in the chain that connects the present Shire horse with his remote ancestors is to be found in the contribution supplied by John Scott to the *Sportsman's Repository* in the year 1820. This writer commences his observations by a description which is as follows: "A capital Cart-horse should not be more than 15 hands in height, with a brisk sparkling eye, a light well-shaped head, and short prickled ears, full chest and shoulder, but somewhat forelow, that is to say, heavier in his rump than his forehand. He should have sufficient general length, but be by no means leggy, large and swelling fillets, and flat bones. He should stand wide all-fours, but widest behind, bend his knees well, and have a brisk action walk." From some of his expressions, notably those referring to being lower in front and the bending

of the knee, to say nothing of height, it appears probable that John Scott had the Suffolk mare more in his eye than the Shire at the time he wrote. This impression is confirmed by some of his subsequent remarks, as for instance his admission that one or two of his points were not in accord with opinions of "late years", as many Cart-horses, he observes, "that realized the highest prices, stood 17 hands at the shoulder, and also showed the lofty forehand with the flat shoulder of the Coach-horse".

John Scott refers to the "large blacks" of the Midland counties and the Suffolk as the chief breeds of heavy horse, and states that the great Cart-horses of the Midlands were principally bred in Derbyshire, Warwickshire, Nottinghamshire, Lincolnshire, and Leicestershire, and that this variety has been reared in the lowland pastures of these shires from Flemish and Dutch stock. He admits, however, that in "distant" times only Belgic stallions were imported, but later, through the "systematic activity" of Bakewell of Dishley, mares of the first size were also brought from Flanders, and a breed of Thoroughbred horses with foreign blood on both sides was formed. These, he further states, were so improved that Bakewell, "about thirty years since", sent a black Cart stallion up for the king to see, recommending him for a sire of saddle horses; but though the horse had a light head well set on, deep shoulders, flat bone, and the action of a pony, his majesty declined the offer thus made him —and no doubt acted wisely. Very probably the extract thus made as to the opinions of John Scott may be in accord with the views of many persons who have devoted their time to the investigation of the ancestry of the Shire horse; but whether his statements are reliable or not, so far as the importation of foreign mares is concerned, they may nevertheless be interesting to many. It is of importance also to learn from Scott that the object of the breeders of the Bakewell era was to produce horses of 17 hands, and of proportionate bulk and weight, whilst the chief and most favoured colour was black. The larger-proportioned horses were, of course, for agricultural and heavy draught, whilst Scott adds that the inferior-sized ones were utilized for cavalry purposes and funerals.

Having thus attempted to trace briefly the genealogy of this ancient breed, through the long period that has elapsed since the days when the earliest kings of this country first directed their attention to the improvement and development of the native horse, it now becomes necessary to consider the variety from the point of view in which it at present exists. Before doing so, however, it may be desirable to cast back one's memory to the vicissitudes through which the old War-horse has passed —assuming that he is accepted as the direct ancestor of the modern

Shire horse, and there appears ample ground for believing that he is. In support of this contention, there can be no doubt that the horses which descended from those employed for the purposes of war by the ancient Britons were crossed with heavier animals imported into England from beyond the seas, and it is scarcely likely that, when the horse-breeders of a nation were encouraged by their successive sovereigns to persevere, the strain they were at work upon would be permitted to die out. Besides, the persuasive powers of such monarchs as King Henry VIII could hardly fail to render his subjects complaisant instruments in his hands, and his predecessors upon the throne, moreover, do not appear to have belonged to the class of ruler that would allow their subjects to stultify their royal efforts to improve the equine race, without offering the most vigorous remonstrances applied in a highly practical form. Therefore it is reasonable to assume that until the days of King Henry VIII, at all events, the blood of the Old English War-horse had not been lost, but, on the contrary, had been improved by judicious crossing. Subsequently to that period the Great Horse had become fairly established, and the fertile pastures of the great inland shires were the localities in which the breed was chiefly fostered and produced. The troublesome times which preceded the restoration of the Stuarts may very probably indeed have affected the progress of the animal, as it is only reasonable to infer that Cavaliers and Roundheads alike were not over-particular as to what means they took to get possession of suitable remounts for their cavalry, and doubtless many an excellent stud was broken up in consequence. Probably, therefore, a temporary check to the advancement of the breed may have resulted, but it still survived; and in spite of the unfavourable criticisms passed by the Duke of Newcastle upon the breeders of that period, they could not have been so incompetent after all, for no allusions are subsequently made by later writers to the depreciation in value or degeneracy of the Great Horse. On the contrary, though a lighter variety of animal was being bred as well, the big ones were at the same time being quietly improved.

Although the horse-breeders of England during the past century do not appear to have been benefited by any ultra-enthusiastic chroniclers of their doings, at all events during the earlier portion of that period, there are substantial grounds for assuming that they were working on methodical lines, and, so far as time and opportunity would permit, were manufacturing a breed of native horses. John Scott alludes to the fact in the quotation given from his writings on a former page, and confirmatory evidence is found in the statement that an imported Flemish stallion, which was travelling some of the shires about the year 1820,

was the recipient of very little patronage from the farmers in those districts, this tending to show that the English-bred animals were in their opinion the superior.

The increase in stature made by the Great Horse, and the intelligent desire to increase still further his proportions, likewise point to the fact that breeders, if quiet, had none the less been working for the improvement of the breed, whilst the high prices that were realized by the taller animals point conclusively to the upward tendency of the market, which, after all, is the chief barometer by which the popularity and position of a variety can be discovered. It may, therefore, be accepted as a fact that there was a supply of 17-hands horses available in the earlier quarter of the nineteenth century for those who cared to pay for them; and this being so, the evolution of the old War-horse from an undersized, though willing creature, to an equine giant of huge strength and magnificent proportions became an accomplished fact.

During more recent years, the lines of breeders of the Heavy Horse—it would be premature to refer to the animals just yet as Shires—were cast in pleasanter places. There was, in the first place, a ready-made animal for them to exercise their ingenuity upon, the principles of horse-raising and the management of stock had become far better understood, and the facilities for arranging crosses of blood had been infinitely increased. In suggesting that the Heavy Horse men of the nineteenth century have laboured under fewer obstacles than those which confronted their predecessors, there is, however, no desire on the part of the writer to minimize the value of their work. On the contrary, had it not been for their perseverance and intelligence, combined by a liberal expenditure of time and money, the position of the breed would be nothing like what it is. The perfection of any animal—and the Shire horse, as he now exists, is on the threshold of perfection—is always a very difficult task. Still, it is very reasonable to presume that, within the space of a few years more, the number of misfits will be much reduced, and the imperfections which now detract from the value of many a grand specimen of the race will be much less frequently met with.

The present position of the Shire horse may therefore be taken to be that of an animal that can always command a ready sale, both at home and abroad. He possesses a whole army of influential supporters, and is generally accepted as a most profitable animal to breed, and a very useful one to possess by those who require the services of powerful horses. On the other hand, it would be idle to deny the fact that the Shire horse, like many another good animal, has his detractors, who prefer some other breed. His enormous proportions, for instance, are

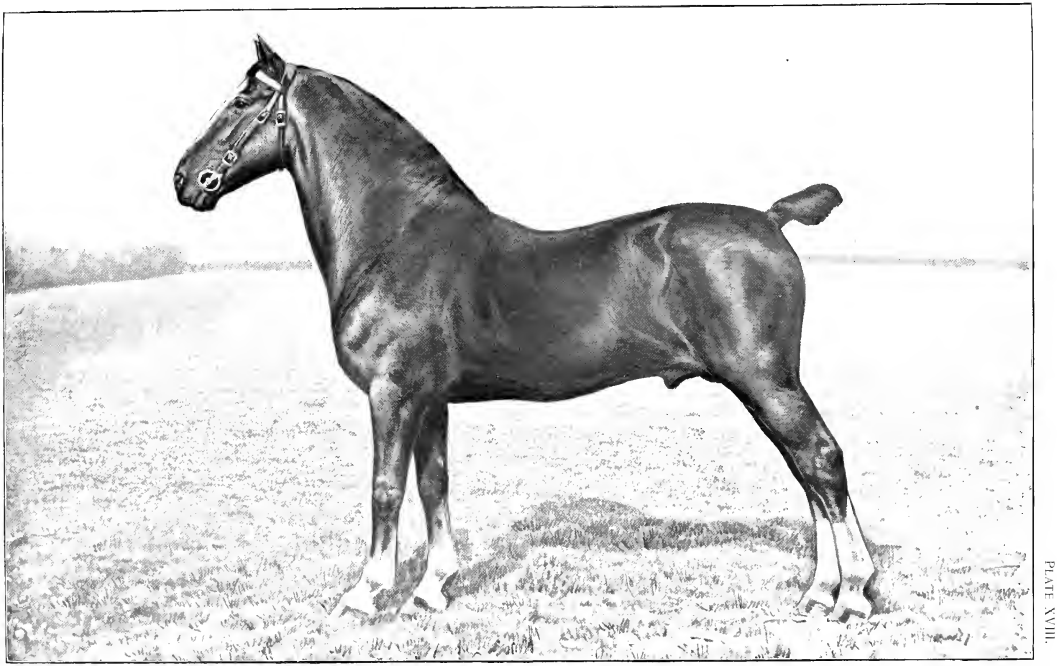


PLATE XVIII.

HACKNEY STALLION, POLONIUS 4031

Chestnut Horse by Wildfire 224, dam 1301 Ophelia by Dominick 177 or Danegelt 174 Winner of numerous prizes and sire of many winners
The Property of R. Whitworth, Esq.

objected to by some, who express the opinion that he is unnecessarily big, oblivious of the fact that it is by virtue of the weight he can throw into his collar that he is enabled to walk away jauntily with such a load behind him as would have appeared incredible to his admirers of a century ago. It is possible that in employing Shire horses for agricultural purposes in some districts their owners are not making the most of their strength, and that a lighter animal would do the work equally well, and in a shorter time; but the whole aim and ambition of breeders of this variety of stock has been to produce the most powerful horses procurable for the purposes of heavy work, relying on the misfits, or such as do not come up to this standard, for purposes of lighter draught. As regards the food question, it naturally occurs that a large frame requires a great deal of keeping up, and if size and weight be required, they can only be maintained by the supply of a liberal amount of nourishment. The firms that employ Shires would scarcely continue to do so did they not find them remunerative slaves; and considering that these animals possess no equal in size or power, and that there is no other breed that can fulfil their duties equally well, it appears that the contentions of their opponents savour somewhat of the hypercritical.

There remains, however, one further point upon which the detractors of the Shire horse are united, and that is, the amount of silky hair or "feather" which adorns his legs. This, it is contended by some, is absolutely prejudicial to the welfare of the horse; they assert that it is productive of grease and other kindred ills; that a profusion of feather presupposes a coarse skin; and, above all, that any animal that is the possessor of much hair is totally unadapted for agricultural work, as its legs would soon become clogged with soil if it were put to work on wet and heavy ground. As may be readily supposed, the above objections to the Shire horse, as promulgated by his opponents, are vigorously combated by those who are included in the circle of his admirers; whilst, placing aside the two first charges laid against feather, as being more suited for consideration by the veterinary portion of this work, it may be suggested that as the labours of the very heavy feathered Shires are more usually restricted to town than country work, the possibility of its being clogged does not apply with any particular force. Nor can it be supposed that the breeders of Shire horses are influenced in their desire to produce plenty of hair upon the legs by merely sentimental feelings, for this is not the case. They assert that without feather there is likely to be a deficiency of bone, both as regards quantity and quality, each of which is essential in the composition of an animal possessing such an enormous frame. It is only fair, therefore, to allow the breeders who

have studied the matter and thought it well out to decide what is correct and what is not, in connection with the attributes of the breed, as it is certain that the practical men in whose hands the variety now is, would be the last to introduce any fancy points into the composition of an animal in the excellence and utility of which they take so much pride, and whose development is a source of both profit and pleasure to themselves.

From the ancestry and uses of the Shire horses we pass on to notice the general appearance and the salient features of the breed. Here we have based our description upon the ideas of the late Mr. Sexton, which are published in the official Stud-book of the Shire Horse Society. It may, however, be premised that while differences may be found in the appearance of the horses that come from different districts, it is noticeable that during the past few years a greater uniformity of character has been brought about through the efforts of the Shire Horse Society, and the loyal support it has received from breeders and exhibitors in all parts of the country. This is to be accounted for by the facilities for interbreeding which the development of railways has provided, and also by the strict adherence to the standard that has been set up by members of the society and outside breeders alike, whilst the general disposition that exists to support the same type, is in itself a resolution that has most favourably influenced the progress of the breed during the past few years.

As to the matter of conformation, it need hardly be said that in the general make-up of the Shire horse the head is a very important feature, and particularly in the case of the stallion. Here it should be of decidedly masculine appearance, with nothing of the gelding or "quality horse" about it. It should be long, not too lean, but massive, with a broad forehead, long thin ears pointing rather forwards, and bright and fairly prominent eyes. The forehead should neither be too prominent nor too flat. The nostrils should be capacious, and the jaw deep and strong, with a liberal distribution of strong hairs over the skin. It can scarcely be contended that the head-piece of a Shire horse is exactly pretty, but when well set out and in harmony with the rest of the body it gives finish and character to the whole. The neck is of fair length only, but not too long, rather substantially developed, nicely arched, and well proportioned; whilst the shoulders, which are a most important point in connection with the development of any variety of draught horse, should slope a little from the withers downward and forward, but not too much so. If they are too straight the movements are clumsy, and the activity of the horse becomes impaired; whilst on the other hand, if they slant like

those of a Hack, they do not so well adapt themselves to the purposes of draught, since they fail to fit the collar as is desired. The girth of the Shire horse is, of course, enormous, but not unnecessarily so when it is remembered that a plentiful supply of heart and lung room is desirable in the case of most animals, and in none more so than in those which are called upon to exercise their highest powers of draught and to undergo long and continuous exertion. The ribs consequently should be well sprung, and the loins wide and powerful, the back being short and level, whilst the quarters must be long, of great strength, and as muscular as possible. The tail should be well set up; when low down it gives the quarters a drooping character, and spoils the top-line. The fore-legs, which are a most important item in any draught-horse, should be short, straight, and well set apart. The arms should be wide and muscular, and join on to big bold knees; while the legs below should be flat and clean, and the outline of the sinews clearly marked, the latter point being a very essential one to secure. Strength of pasterns is a most desirable quality, but these parts are most objectionable when unduly long or unduly short. There is another point to be considered in connection with the fore-legs, and that is in regard to their position when compared with the body of the horse. They should be nicely set under him, squarely and truly, so as to receive and support the full weight of his frame as evenly as possible, since if out of the plumb-line the strength of the fore-legs will be materially diminished. Scarcely of less importance are the hind-legs, as upon the formation of these limbs depends much of the ability to start away with and keep in motion a heavy load, whilst in backing they are indispensable. They should be rather inclined to be straight, a decided bend being a bad fault in a draught-horse. The hocks require to be broad in front and deep behind, and, of course, perfectly clean and free from any symptoms of weakness or disease. Below the hock the canons should be heavy in bone, showing a girth of at least 1 inch more than the corresponding part below the knee. The joints should be large, and free from structural defect, else the value and utility of the horse will be diminished. Both the fore- and hind-legs should be plentifully supplied with long silky hair, extending a considerable way upwards from the ground in the direction of the knees and hocks, and finer in quality in mares than horses. If this is coarse in quality or curly it is a fault. Full allusion has already been made to the question of the "feather", and it only remains to say that without it in profusion neither sires nor dams are qualified for prizes or patronage. Next comes the all-important question of feet, than which none is deserving of greater consideration on the part of breeders and

judges; for however grandly topped a horse may be, he is of no use to anybody if he has not legs and feet to carry him. In this connection it is essential to see that the fore-feet are of the same size, for often they are not, and this, of course, will detract considerably from the value of the animal. They should be wide and open at the heels, and of a good size, and the horn should be dense, tough, and dark in colour. The hind-feet should stand square with those in front, turning neither out nor in, and be hard and durable. The height of a Shire horse should be a good 17 hands when he is full-grown, whilst in the case of mares less height is permissible, but 15·3 hands at shoulder is quite small enough.

There is a considerable latitude permitted to judges in their selection of a Shire horse so far as the question of colour is concerned, but it is noticeable that during late years there has been a perceptible increase in the number of chestnuts, whilst the old-fashioned blacks have proportionately decreased. Still, if breeders were to be polled, it would probably be found that blacks, bays, and browns were the most popular shades, grays, which at one time were highly prized, being not so much liked as formerly, though why it is hard to conceive. In addition to the chestnuts, a few roans keep on appearing, in spite of there being a certain amount of prejudice against them in some quarters.

The action of the Shire horse is not by any means an attribute of the breed that can be overlooked, for, as may be readily imagined, a draught-horse that is unable to get away briskly with a load behind him is at a great disadvantage, both from the point of view of the breeder and of the employer of horse labour. The walk should therefore be a fast and even one, plenty of liberty being associated with the movements of the shoulders, whilst the hocks should be used in such a fashion as to bring the hind-feet well under the belly of the horse. Nor should the trot, although of a lesser importance, be overlooked, for an animal that can discharge his load and then get back again quickly to pick up another one is naturally of far greater value than the horse which lacks freedom and force of action. Of recent years, a very decided improvement has been noticeable in the trotting gait of the Shire horse, and his value, commercially speaking, has increased in proportion to the greater nimbleness he displays at this faster pace.

It is impossible to write of the Shire horse without reference to the Shire Horse Society, which in recent years has done so much to improve him. The noblemen and gentlemen who formed this body have succeeded, it may be conscientiously suggested, beyond their most sanguine expectations in effecting an improvement in the breed to whose interests they

LINCOLNSHIRE LAD II (1365).

Lincolnshire Lad II was a grey horse 17 hands high, and was bred by Mr. Fred Ford, Locko Park, Derbyshire, in 1872. He was by Lincolnshire Lad, 1196, out of Madam by Matchless, 1506. Early in his career he was owned by William Harriman, Wilsthorpe, Derbyshire, and William Clark, Locko, Derbyshire, and afterwards by Mr. Kyte of Derby, of whom Captain Heaton purchased him in 1881. He served at Worsley and Chatteris, in Cambridgeshire, up to 1885, when he passed into the hands of Mr. Walter Johnson of Hatfield, who travelled him in the Doncaster district one season at a service fee of two pounds, but being poorly patronized he was subsequently let to a society in Montgomeryshire for four years, where he left some wonderful stock.

On his return to Hatfield he stood at a fee of five guineas until sold to Mr. Fred Crisp about Christmas 1893. At the Southgate stud he had two full seasons at an advanced fee of ten guineas, and died on June 23rd, 1895, at the age of 23 years. Most of the best shire stock now in the country have descended from this grand old horse.

Champion Harold, his best son, got more valuable shires than any sire of the breed, and his sons and daughters continue to keep up his name and fame by transmitting his excellent qualities to their offspring.

Lincolnshire Lad II was also the sire of Paxton; Buckton Harold, 11,059; Eastoft Lad; Famous Lad; Majestic; Handcuff, 4457; Lincolnshire Boy, 3188; Carbon, 3523; Lancashire Lad II, 6031; Dunsmore Barrier, 13,011; Potentate, 12,086; The Boy; and other famous sires and dams, from whom have descended many of the best horses in the country.

MADAM

Matchless, 1506

2nd Dam

William the Conqueror (Sysonby)

3rd Dam

Orby, 1898

Farmer's Glory, 1911

Dragonara, 1907

Honeyed Tone, 1900

Brown Horse (Hilton & Colby's)

Lion, 1898

5th Dam

Dumpling (Breckspear's)

LINCOLNSHIRE LAD, 1196

Lincoln (Lister's)

2nd Dam

Britain (Lister's)

3rd Dam

K. 1195

4th Dam

Pregnant (Hobson's)

5th Dam

Counsellor 511

6th Dam

K (stephenson's)

6th Dam

Kemper Gilda
(Boor & Bonner's)

Honest Tom, 1905

7th Dam

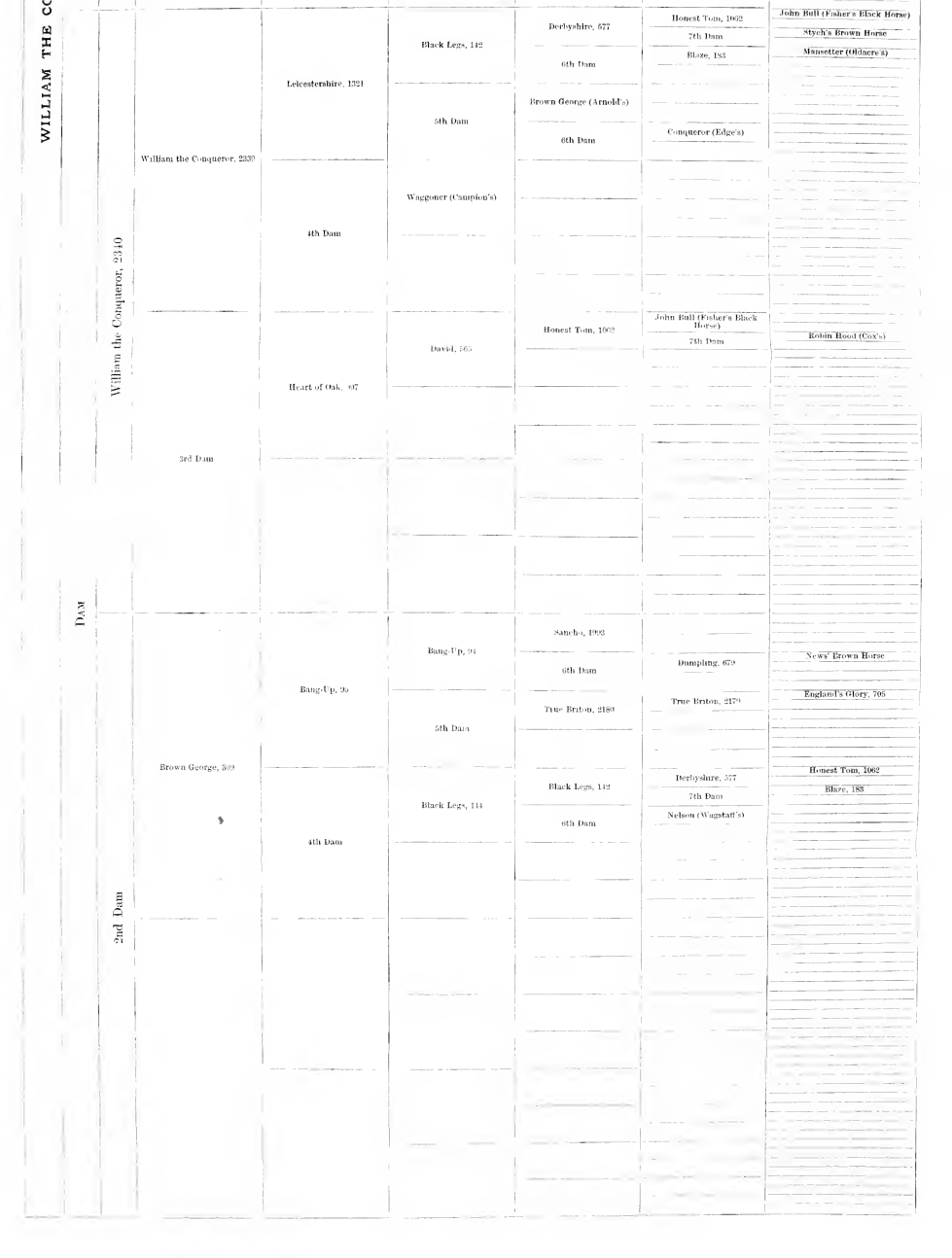
Maximum Bonnie, 1838

Honest Tom, 1861

England's Glory, 796

7th Dam

Peterborough, 1777


WILLIAM THE CONQUEROR, 2340
William the Conqueror, 2340
Dam
2nd Dam
William the Conqueror, 2330
3rd Dam
Leicestershire, 1321
4th Dam
Heart of Oak, 67
Brown George, 309
4th Dam
Bang-Up, 95
Black Legs, 142
5th Dam
Waggoner (Champion's)
David, 565
Black Legs, 114
5th Dam
Derbyshire, 577
6th Dam
Brown George (Arnold's)
6th Dam
Honest Tom, 1062
Sancho, 1093
6th Dam
Tyne Briton, 2180
6th Dam
Honest Tom, 1062
7th Dam
Blaze, 183
7th Dam
John Bull (Fisher's Black Horse)
7th Dam
Dumpling, 679
7th Dam
Derbyshire, 577
7th Dam
Nelson (Wagstaff's)
John Bull (Fisher's Black Horse)
Stych's Brown Horse
Mansetter (Oldacre's)
Robin Hood (Cox's)
News' Brown Horse
England's Glory, 705
Honest Tom, 1062
Blaze, 183

Hodgetts Colo. 1882

John Hall (Fisher's Black Horses)

WILLIAM THE CONQUEROR (2343)

A brown horse, bred by Mr. Barrs of Repton Park, Nottinghamshire. He was foaled in 1862, and was by Leicestershire (Domber's) out of a mare also bred by Mr. Barrs, but whose pedigree is not known.

He remained in the possession of his breeder until about 1875, when he passed into the hands of Mr. Kyte of Smalley, Derbyshire, who travelled him for a season or two and then sold him to Lord Ellesmere. He was subsequently repurchased by Mr. Kyte, in whose hands he died in 1883 at the age of twenty years.

Special attention was first directed to him as a sire by the success of two of his sons (geldings) in the show ring, but it was not until he became advanced in years that his merit as a stock horse became generally recognized. He was not a big horse, but had some wonderful legs and feet, and when mated with sizy Derbyshire mares he produced some excellent stock.

At the London Show in 1883 his son Esquire, sire of Shrewsbury, Knight of the Shire, and other good horses, took first prize as a yearling. In 1884 that good horse Prince William, 3956, another of his get, occupied a similar position in the one-year-old division, and Esquire again took first in his class. Prince William was afterwards sold to Mr. John Rowell for 240 guineas. As a three-year-old he continued his success at London and elsewhere, and was purchased by Lord Wantage for 1500 guineas. Since that time he has proved as successful at the stud as he was in the show ring.

William the Conqueror was also the sire of Staunton Hero, 2918; Endymion, 3073; Blyth William, 4260; Royal William, 4661; Carlton William; Hengest, 4452; Hitchin Conqueror, 4458; and many others who have distinguished themselves both at the stud and in the ring.

have pledged themselves. As a result of their exertions, the annual show in the early spring of each year has come to be regarded as one of the most popular exhibitions of its kind that is held in London, and it is, moreover, the means of attracting the attention of many persons to the merits of the Shire who would otherwise have been ignorant of, or indifferent to, the value of this class of horse. As a proof of the higher estimation in which Shire horses are held compared with that of only a few years ago, and the increased value now set upon them, a little information concerning the prices paid for some of the most representative animals of their respective generations may be referred to. Amongst them are the following:—Sweet William, a noted horse, was sold in 1778 for 350 guineas, whilst a few years later a horse called Marston changed hands at 500 guineas. These figures may be regarded as exceptionally high ones for the times, but they offer a striking contrast to those of a more recent period. In 1882 Sir Walter Gilbey paid 800 guineas for Spark, with which horse he won the Challenge Cup at the Society's show in 1883; whilst three years later Lord Wantage was content to give Mr. John Rowell 1500 guineas for his champion colt Prince William, when only two years old. These long figures were, however, far exceeded when the Earl of Ellesmere paid 2000 guineas for the black Vulcan, which had never been seen in a show-ring at the time, though the judgment displayed in selecting the horse was fully vindicated by his taking the championship at the Shire Horse Society's show in the years 1889 and 1891. Even then, however, the highest price to be paid for a Shire stallion was not reached, as a year later Mr. Joseph Wainwright purchased of Mr. John Rowell the black colt Bury Victor Chief, which had achieved supreme honours at the above national show in 1892, for the hitherto record price of 2500 guineas, after the youngster had added to his London triumph by securing the leading honours at the Doncaster show of the Royal Agricultural Society of England: and everyone was pleased when Bury Victor Chief repaid his new owner for his enterprise by securing for him the Challenge Cup of the Society in 1894. Such figures as the above cannot fail to impress upon readers the enhanced value of the Shire horse of the present day, and the important position he now occupies in the equine world. That his popularity is likely to be still further increased is absolutely certain, and the success which the Shire Horse Society has achieved should stimulate the supporters of other breeds to unite together and work amicably for the furtherance of the common object which they have in view—namely, the development of the horse upon which they have centred their interest, and in which their capital is invested.

Clydesdales.—The resemblance which exists between the Clydesdale and the Shire horse may possibly be regarded by persons who are not intimately acquainted with the points of heavy horses as being very close; though, as may be seen by a comparison of the descriptions which appear in this volume of the two varieties, the opinion would be a most incorrect one in several respects, and notably in weight and the position of shoulders as well as in the length and spring of the pasterns. Regarding the origin of the Clydesdale, there is not the same explicit information forthcoming as there is to be obtained with reference to the ancestry of the English horse, and even the most enthusiastic supporters of the former variety are divided in opinion concerning the source from which it was originally obtained. According to the authority of the Clydesdale *Stud-book*, the more popular but least satisfactory explanation is, that the breed comes of a cross between some Flemish stallions that were imported into Scotland over two hundred years ago by an ancestor of the then Duke of Hamilton, and the mares that were in the country at that period of its history. The alternative, and more reasonable, theory of the origin of the Clydesdale is, that the breed owes its existence to the perseverance and capacity of the farmers who then resided in the valley of the Clyde; this hypothesis being strengthened by the impossibility of discovering any reliable data in support of the story of the Duke of Hamilton's ancestor having imported any Flemish stallions into the district during the seventeenth century. In fact, William Aiton, a well-known writer on Scottish agricultural subjects, appears to have made full enquiry into the truth of the story, with the result that he could find no one at all who had ever heard of the existence of the Flemish sires, and all they knew of them was gathered from their reading.

Suffice it, therefore, to recognize the fact that the Clydesdale horse has existed, and been highly valued by the inhabitants of his native district as a distinct breed, for many generations. No doubt, however, the original horse of Scotland, wherever it may have sprung from, was like the ancient War-horse of England, a very much smaller animal than its modern descendant. At the same time, there is evidence forthcoming that so-called "large horses" were recognized in Scotland as far back as the year 1352, this information being supplied by the "safe-conduct" from Edward, King of England, to William Douglas, Knight, of Scotland, to enter the district of Teviotdale, then in the possession of England, with "ten grooms and ten large horses". This "conduct" is still in existence, and unquestionably may be accepted as evidence that even at that remote period of the world's history there were fair-sized horses of some sort or other to be found in parts of Scotland. Unfortunately, however, as Mr. Thomas Dykes observes, no information is forthcoming as to the precise localities from which these

"large horses" were brought, though it may not be unreasonable to infer from contemporary events that they came into Teviotdale from Lanarkshire. One other point in connection with these particular horses which is worthy of consideration is the fact that the adoption of the word "magnos" in the aforesaid "conduct", which was in Latin, is an unusual addition, as no qualification of the word "equos" was added to the customary conducts that were issued, this showing that the animals which found their way to Teviotdale were unusually big. It is, of course, quite possible that, as their stature seems to have been exceptionally great, they may have contained the blood of foreign horses in their veins. Still, it does not appear that the horse-breeders of Scotland, such as they then were, displayed anything like the amount of interest shown by the English in the improvement of their stock, though in the reign of King David II, who ascended the throne in 1329, many foreign horses were imported into the country with the object of increasing the size of the native animals. After the reign of David II, there seems to have been no serious attempt made to increase the value of Scottish horses until James IV ascended the throne in 1488, but he soon began to do what he could to benefit horseflesh in Caledonia by importing sires from Spain and Poland, though these belonged rather to the light class of animal. King James V, however, seems to have recognized the desirability of increasing the size and power of the native horse, and issued a law that large-sized stallions and mares were to be kept by the upper classes, just as in England persons of quality were expected to maintain the position they aspired to by their patronage of the equine race, on lines defined by law.

What the breeding or stature of these large-sized stallions was, it is impossible to ascertain; but it is quite reasonable to infer that they possessed a great deal of Flanders blood, even if they were not clean-bred specimens of that variety, as large numbers of the blacks in question were constantly crossing the Channel at that time in order to improve the race of English horses, which, whatever their other great qualities may have been, were notoriously deficient in size. Most probably the Galloway of that period was the breed upon which the breeders who were attempting to effect an increase of size in the draught-horse of Scotland first set to work, and of these Galloways it was stated that they were fit for saddle, load, or draught, their strength and size having no doubt been increased by good breeding, and care in the selection of stallions, as the animals from which they sprang were certainly nothing remarkable in size, but rather the reverse. A very possible reason for the horse-breeders of Scotland not having exerted themselves to produce extra heavy horses, is to be discovered in the fact that most of the ploughing was done by oxen, whilst the unsettled condition

of the country and the poverty that prevailed no doubt contributed to the curtailment of any sort of enterprise in breeding. At the same time, there are ample grounds for the opinion that some attempts, and satisfactory attempts too, had been made to improve the race of Scottish horses, it being more than probable that both Cleveland Bay and Flemish crosses were utilized for the purpose. Great credit is due to the "Society of Improvers" of Edinburgh, who, so far back as the year 1759, offered a prize of fifteen guineas for the best draught stallion, this being won by the bay entire horse Red Robin, the property of William Whyte, a tenant farmer of Polmont.

Writing so far back as the year 1782, the Rev. David Ure, the minister of Rutherglen, in his history of the parish in question, states that the horses of Clydesdale had become famous long before that date. He adds of the once famous Rutherglen Fair that "the market day is not now frequented, but six fairs are held annually in the town and are famous for the best horses in Europe". This little compliment to the value of the animals changing hands at Rutherglen may probably have been an exaggeration, but Mr. Ure's eulogies may be accepted as valuable, for they prove two facts conclusively—first, that the Clydesdale horse was recognized as a distinct variety and had been for some time; and secondly, that the breed sold well in far-off 1782, else there would have been no support forthcoming for the six annual fairs.

The worthy minister also adds that—

"A high degree of credit is due to the farmers for their unremitting endeavours to improve this excellent breed. They pay strict attention to every circumstance respecting the colour, the softness and hardness of the hair, the length of the body, breast, and shoulders of their breeders, sire and dam. No inducement whatever can lead them to encourage the breed of a horse that is not possessed of the best qualities. . . . Every farm almost throughout the extent of several parishes supports six or at least four mares, the half of which are allowed annually to foal. The colts are mostly sold at the Fairs of Lanark and Carnwath, and bring to the owners from five to twenty pounds each. These are generally purchased by farmers from the counties of Renfrew and Ayr, where they are trained for the draught until about five years old. They are then sold at the Fairs of Rutherglen from twenty-five to forty pounds each, from whence they are taken to the Lothians, England, &c., where they excel in the plough, the cart, and the waggon."

The position of the Clydesdale may therefore be regarded as having been clearly recognized so far back as 1782; but writing eighteen years later in the *British Farmer's Magazine*, William Aiton, referred to above, takes

exception to the title of Clydesdale being conferred upon the breed, which he refers to as the Lanarkshire, though he admits that "they are natives of every county of Scotland south of the Tay, and therefore ought rather to be denominated the Scottish breed of horse". Aiton, it may be added, appears quite to have shared the Reverend David Ure's enthusiasm for the variety, as he described it as "the most valuable breed of draught-horse in Britain, not only for farming business, but for every description of work where strength, agility, and docility of temper are required". Aiton also confirms Mr. Ure's description of the breeding of these horses by farmers in a small way, whilst he expresses the opinion that much of the improvement that had been effected was due to the better feeding and treatment received by the animals.

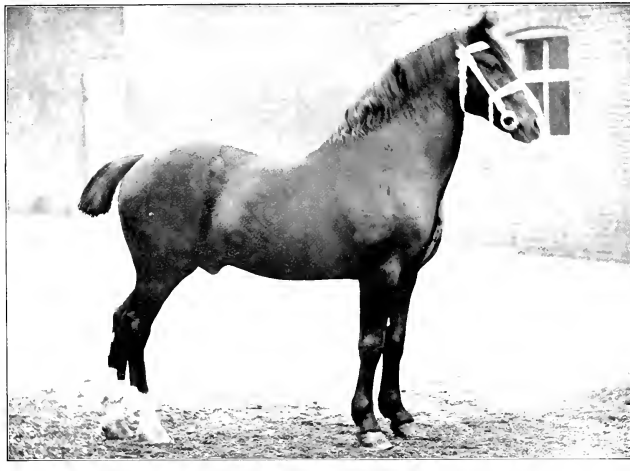
As there appears to be a certain amount of doubt concerning the exact tap-root from which the modern Clydesdale originally sprang, a description of some famous mares, all of which died out at about the commencement of last century, may be read with interest. Some eighty years previously, that is about the year 1715, it is stated in the *Stud-book* of the Clydesdale Society, one John Paterson of Lochlyoch, in the parish of Carmichael, went to England and purchased a Flemish stallion, which he brought home and crossed with the North Ward mares, the result being that the produce became known for their excellence all over Scotland. The Lochlyoch mares, it is added, were generally browns and blacks, with white faces and a little white on their legs. They had gray hairs in their tails, occasional gray hairs over their bodies, and invariably a white spot on their belly, this latter being recognized as a mark of distinct purity of blood. It was no doubt principally due to the influence of the black Flemish stallion of 1715 that so many of the Lochlyoch mares were so dark in colour, as it must be remembered, as stated above, that it was a bay stallion that won the first prize offered by the "Society of Improvers" at Edinburgh, in 1759; bay, therefore, must have been accepted as a correct colour of the breed upwards of a century ago.

Before that period the history of the Clydesdale, as may be gathered from what has been said, is obscure. In fact, there are reasons that have been pointed out by writers upon the breed, for accepting with the greatest caution the information that has been forthcoming from authorities of a later period. This information was doubtless given honestly and in the best of faith, but it is at the same time quite within the limits of possibility that inaccuracies may have crept into the narratives that have been told. As a case in point, allusion may be made to the case of the famous stallion Glancer, 335 in the *Stud-book* of the Clydesdale Society,

which horse is there stated to have been foaled about the year 1810. The correctness of this, however, has been impugned, as a writer in *Heavy Horses*, an authoritative work on these breeds, which is edited by Mr. James Sinclair, who occupies a similar position on the *Live Stock Journal*, draws attention to the fact that if Glancer was foaled in 1810, he must have sired one of his most successful foals—Paton's Horse, which took second prize at the Highland and Agricultural Society's show in 1842—when he was five-and-twenty years of age. This, of course, was not an impossible feat to accomplish, though it is an improbable one. Be the date of his birth, however, what it may, there is no doubt whatsoever that Glancer, who was also known by the designation of Thompson's Black Horse, is the corner-stone of many a modern Clydesdale strain. Whether the contention put forth by many breeders — namely, that Glancer was a direct descendant of the Lochlyoch mares referred to above—is a correct one or not, it is impossible to ascertain; but it is generally believed that the dam of the famous black, known as the Lampits mare, inherited the blood in question.

It was of course impossible that a breed like the Clydesdale, the merits and value of which became generally recognized almost as soon as the horse was known, would long remain without supporters in other districts than that from which he derives his name. The middle of the nineteenth century, therefore, saw the Clydesdale being bred in other parts of Scotland, so that in course of time the Galloway Clydesdales became recognized as a leading branch of the old tree. These animals were possibly the result of crossing the Clydesdale stallions with the old Galloway mares of the heavier type, which are referred to by the Rev. S. Smith, who wrote in 1810, as being "inferior in size to the dray-horses of many other districts, though they are capable of performing as much labour and enduring still more fatigue, whilst they are more easily kept and less liable to disease". The reverend author describes these animals as being "round in the body, short in the back, broad and deep in the chest, level along the back to the shoulders, not long in the legs nor very fine in the head and neck: their whole appearance indicating vigour and durability, and their eye commonly a sufficient degree of spirit". There is also information, dating from about the middle of the century, which refers to Ayrshire Clydesdales, and Kintyre, Aberdeenshire, and Cumberland strains, all three of which could trace back to the Lanarkshire root, and cast no discredit on the good horses whose blood they inherited.

At the same time, there are strong grounds for believing that, many years ago, there were Shire stallions standing in Aberdeenshire, and con-



PACK-HORSE TRIUMPH II

By Cotterel, dam by Sportsman

Photo by Reid Wilson

DARTMOOR PONY STALLION, GOLDFINDER

Winner at Brent Show, S. Devon. The Property of Victo Shaw, Esq.

sequently it is very possible that this blood was resorted to by breeders of an experimental turn of mind with the object of improving their studs. Whether the introduction of a Shire horse is a judicious act on the part of a Clydesdale owner is, of course, a question that each breeder must answer for himself; but it may be stated that the late Mr. Lawrence Drew, up to the date of his decease, in 1884, entertained the strongest opinion upon this subject. This gentleman contended that the Clydesdale and the Shire horse were practically one flesh, and that the most superior draught-horses were to be obtained by crossing the two breeds. Such a doctrine was very naturally regarded as the rankest heresy by the majority of both Shire and Clydesdale breeders, but Mr. Drew was loyal to his convictions to the last. The most famous animal ever owned by him was the dark-brown Prince of Wales, 673, which was foaled in 1866, and lived until he was twenty-two years old. This horse, so far as his grandsires were concerned, was of unexceptional Clydesdale blood, but the gravest doubts were entertained by some people respecting the breeding of his grandams. Both of these mares, singularly enough, were grays, and it was the opinion of Mr. Nicol Fleming, who bred Prince of Wales, and of Mr. Lawrence Drew, who owned him during most of his career, that both of them were Shire-bred mares. The horse is described as being rather sour in head, and too straight at the hocks, but a marvellous mover in all his paces; and no doubt he got some fine stock, whatever his breeding might have been.

Having thus attempted to trace the history of the Clydesdale through the varying stages of his career, it now becomes necessary to describe the leading characters of the breed.

The head is broad across the forehead, gradually tapering towards the ears, which are rather inclined to be long and large; the forehead is wide between the eyes, which should be full and lively, though free from that hard, harsh look which disfigures the expressions of many horses. The jaws are broad and not infrequently rather coarse about the muzzle, whilst the nostrils are large and open. A narrow head is not to be encouraged, as this is usually associated with an absence of intelligence, whilst small sunken eyes are generally accompanied by a bad temper. The head should be correctly set on the neck, which it should meet at not too acute an angle, the neck itself being lengthy and deep and nicely arched, very massive and powerfully placed at the shoulders.

The shoulders themselves partake far more of the riding character than those of any other draught-horse, as they should be sloping and rather long by comparison with those of the Suffolk or the Shire horse; whilst the chest should be broad and deep, and the fore-legs, a most

important point of the breed, should of course be short to the ground from the shoulder. They ought to be very powerful about the arms, showing great muscle here; with flat, broad knees near to the ground, and with as much bone as possible below them. Below the knee, moreover, the bone should be flat and of a good hard quality; whilst the back of the legs from the knees downwards should be well feathered with soft silky hair, coarse or curly feather being objected to by authorities on the breed.

The pasterns are another point in the anatomy of the Scottish horse in which it differs very greatly from the Shire, as in the Clydesdale they should be rather long and sloping, in order to give springiness to the action, which is so much desired. The feet must be of a good size, correct in shape, strong, and absolutely sound. A malformed or diseased foot, and indeed a small or shelly one, would be perfectly incapable of carrying on a week's hard work upon the stone-paved streets of Glasgow or any other large town in which Clydesdale horses are utilized for heavy draught purposes. The feet, therefore, should be round, wide at the corners, the crust thick, and the heels well developed.

The middle-piece of a Clydesdale should be big and well sprung at the ribs, a flat-sided specimen of the breed being objected to by most judges. The back is frequently a little longer than it should be to be quite in accordance with what is desired. A slight drop in the back is perceptible in some of the very best horses of the breed, and so is not to be regarded as a disqualification or even as a very serious fault, though it is unquestionably unsightly, and should not be encouraged. The quarters are wide, lengthy, powerful, and well let down.

The hocks are connected with the stifles by thighs well clothed with muscle, and are themselves broad, well developed, clean, of course, and set at a nice angle. Below the hocks, the bone should be plentiful and flat, the hocks being near the ground, and the legs perhaps carried a little forward. The feather is abundant and extends upwards to the hocks. The pasterns gently slope and the feet are sound, well shaped, and of ample size.

The chief colours to be found amongst Clydesdales are brown, black, and bay. Gray is admissible but is not usually encouraged, whereas both chestnuts and roans are not recognized. Most Clydesdales are more or less heavily marked with white, as were the old Lochlyoch mares, the excellence of which has been referred to above. The usual and preferable height for a stallion is about 16·3 hands, or an inch over, the mares, of course, standing lower at the shoulder.

The action of a Clydesdale chiefly consists of a light, springy, even walk,

his step being firm and brisk, and his feet being lifted well off the ground. A Clydesdale's carriage has also a great deal to do with his success under a good judge. A gay bearing of the head is much admired, whilst in walking or standing the horse should stand level and straight upon his feet, an inward or an outward turn being a fault, the latter, however, being by far the worst. A free elastic walk is not the only pace at which a Clydesdale can distinguish himself, however, as many of the big Scottish horses are very free-actioned, and have gained quite reputations for being fast and nimble trotters. In fact, at an early Bristol show a Clydesdale outstripped many of the light horses upon the ground; but such a performance is, of course, exceptional.

The constitution of the Clydesdale is remarkably robust, and although he may not possibly belong to so long-lived a variety as the Suffolk, the north country horse can usually be relied on to withstand the effects of cold, wet, and hard work, better than any of the heavy varieties in existence.

From what has been written of the Clydesdale, it will be clearly seen that though he may not have the same claims to the possession of an ancient lineage as the Shire horse or the Suffolk, he is nevertheless an animal of a defined type, and, as a variety, quite old enough to be relied upon as a true breeder to that type. Moreover, it may honestly be contended on his behalf that the Clydesdale supplies a want, which in his absence it would be impossible for the employers of a certain stamp of draught-horse to fill adequately. He is, in fact, the pony of the heavy horses, so freely does he move, the liberty and freedom of his action being possibly inherited from the old Galloway mares from whom he claims to be descended. It is, in fact, impossible to conceive that a more active horse of his weight and height could be produced, even by successive generations of skilful breeders. No visitor to Glasgow can fail to notice how perfectly the breed is adapted for dray and lorry work upon granite streets of a great city. One day's experience of the Clydesdales attached to drays, and walking off with ponderous burdens, would be sufficient to impress a careful observer with the immense value of the breed for heavy draught; whilst the frequently-displayed impetuosity of the horse to commence his work, the swiftness with which he at once fills his collar and steps out again after a sudden check in the streets, his general soundness and excellent constitution, all combine to justify his admirers in the eulogies they bestow upon the Clydesdale, their favourite breed of horse.

The Suffolk. — Perhaps in the eyes of the ordinary visitor to an agricultural show there is no variety of the so-called Heavy Horse more

attractive than the Suffolk. The breed, moreover, comes as somewhat of a novelty to many persons, for, in spite of the great claims possessed by the Suffolk upon the suffrages of the agriculturist and the townsman, it is still in East Anglia that his merits are most keenly appreciated, and, in fact, the farmers in that part of the country prefer the Suffolk to any other breed of heavy horse. It is, however, against the breed that the proportions of a Suffolk do not equal those of a Clydesdale or a Shire horse, many persons being thereby led away into a belief that the east country animals are proportionately weaker than the others; whereas those who are best acquainted with their merits entertain the opinion that, considering his height—16 hands 1 inch is the recognized limit of stature in connection with this variety—the Suffolk is quite as powerful an animal as any other breed of horse in existence.

Probably, therefore, if he were better known, the Suffolk would considerably increase the circle of his supporters; but, in the face of the patronage that is now being extended to both Clydesdales and Shires, the development of the east country horse will be for a time retarded. Nevertheless, he is holding his ground well abroad, and orders keep coming in from various foreign countries, whilst good prices continue to be realized by fair-class animals from buyers who possess practical experience of their merits. No doubt this horse has not the weight or power to draw, through crowded streets, heavy lorries and other such cumbersome vehicles when loaded to their utmost—such duties lie far more within the province of the Clydesdale and the Shire; but in front of a plough, with a good man behind it, a pair of Suffolks can get through a day's work that should amply satisfy the requirements of any reasonably-minded agriculturist. Then, too, for the lighter class of goods traffic in towns the Suffolk is a very suitable horse, for he is so much more active than the Shire or Clydesdale, in addition to being faster than either, that he can get through a day's work in a comparatively light wagon far better than they. Consequently he possesses many friends amongst the managers of railway and other parcel delivery companies, who include amongst the goods they have to handle large quantities of articles, which though not weighty enough to load in their heaviest vans, are still too bulky and cumbersome for express deliveries.

The precise origin of the Suffolk is, like that of most ancient breeds, enshrouded in obscurity, but, at the same time, the antiquity of this horse is absolutely beyond all question. So far back as the year 1720, allusions to the breed in the *Ipswich Journal* are so frequent as to render it certain that it was firmly established at that remote period. Indeed it is asserted by some that the Suffolks were cultivated as a

distinct breed five hundred years ago by crossing the old Norman horse with East of England mares; though it must be observed, in justice to other breeds of less remote antiquity, that the proofs of such assertions are insufficient. Be this as it may, the fact remains that the Suffolks of the present day can boast of pedigrees that extend back as far as 1768, at which period there existed a notable but nameless stallion belonging to one Crisp, a resident at Ufford, near Woodbridge. From this animal every prominent winner at our horse shows to-day, if not every pure-bred Suffolk, is in some way or other descended. It is noticeable, too, that the allusions made to this horse in the *Suffolk Chronicle* and *Ipswich Journal* are substantiated by the writings of persons living about the middle of the eighteenth century, who, according to a writer in *Heavy Horses*, were accustomed to advertise the pedigrees of animals which went back for two or three generations at the very least. In stating that every Suffolk of to-day can take his pedigree back to the nameless horse of Mr. Crisp, it must not be understood that no attempts have been made to effect improvements in the variety by the introduction of outside crosses; but, at the same time, these have all been made in connection with the descendants of the old horse, and, so far as can be gathered by persons who have interested themselves in following these crosses out, they have not been attended with success, as all trace of them has been lost in the course of a few generations. It is known that certain crosses of the old Lincolnshire blood have been attempted, and the experiment of crossing with a trotting horse has also been made—the latter being possibly introduced with an idea of rendering the Suffolk more valuable as a coacher, as it is stated that the breed was cultivated by the owners of stage-coaches in the early days of the eighteenth century, when the rate of progression was slower than it became later on.

It would appear probable that these crosses with alien blood were responsible for the bay animals which formerly appeared in the breed, but for the past half-century the Suffolk Punches have returned to the ancient colour of their race, chestnut, and even the darker shade of this colour has practically ceased to be seen. No doubt many persons more or less strongly object to chestnuts, which are by some considered to be weakly in constitution, and by others to be fretful and irritable in their dispositions; and perhaps the Suffolks may owe to the colour of their coats a little of their failure to gain new admirers as quickly as have some other breeds; but the fact remains that all the original horses of the breed concerning which descriptions are forthcoming were chestnuts, and that the old colour came out again as strongly and as unvaryingly as ever even in the descendants of some of the crosses which were attempted

years ago, as stated above. At the same time, it may be added, in confirmation of the suggestion that his colour has been in some measure responsible for the comparative failure of the Suffolk, that American writers have proposed that an organized attempt should be made to introduce bay Suffolks; but, needless to say, the good sense of English breeders has stepped in and prevented any tampering with the purity of an old-established race, that has already proved its unsuitability for being improved by crossing with other varieties.

Whether the introduction of alien blood is in any way responsible for the appearance of the different shade of chestnut and the white markings that are to be found amongst the Suffolks of the present day, is a question that cannot be settled definitely; but probably it is not so, for, as before observed, the crosses all proved to the highest extent unsatisfactory, and were permitted to die out as far and with as little delay as possible, when their inutility was proved. White markings, though permissible to a certain extent on a Suffolk, are nevertheless very far from being liked, and whilst animals which inherit the misfortune of possessing a bald face or a white stocking are eligible for the stud-book, it is questionable whether the presence of any white beyond a little on the heel, and perhaps a small star on the forehead, would not entirely ruin the prospects of a Suffolk in the show-ring. Of course, no colour of coat other than chestnut is admissible in an animal that is desired to enter for the Suffolk Stud-book Association, it being distinctly laid down that though the shade may vary, there is no place for any horses save chestnuts on the pages of the Society's official volume. The favourite shade of chestnut is the deep bright hue, with mane and tail to match; whereas the mealy, soft, smudgy-coloured animals, while being much disliked, are tolerated. Light manes and tails are also strongly objected to by the majority of breeders, although they need not be regarded as serious faults, much less as disqualifications, and indeed some Suffolk men profess to prefer horses thus marked to the whole-coloured animals. Silvery hairs have distinguished many good strains of Suffolks, it must be remembered, whilst the very dark-hued animals are considered by some breeders to be the best constitutioned of any, though on this ground there are differences of opinion. The late Mr. Hume Webster, in his pamphlet on the breed, actually went the length of asserting that there were about seven shades of chestnut Suffolks, varying from the mealy to the brown-black, the extreme colours being the least liked, whilst the hue which he refers to as "guinea-gold" he selected as the most popular, not only in this country but amongst American buyers.

In addition to his colour the Suffolk is distinguished from the Clydes-

dale and the Shire horse by the fact that he is a clean-legged animal, and does not possess the extreme amount of feather that is so much sought after by breeders of these varieties. This circumstance may very possibly be accepted as an additional reason for the slowness which has characterized the headway made by the Suffolk amongst agriculturists, for they are great advocates of hair and bone, and a general belief prevails that if hair is absent on a heavy horse's legs, bone is certain to be deficient likewise. This, however, is not generally accepted by the breeders of Suffolks, who support their contentions by measurements, and assert that their favourite horse—that is, when his height at shoulder and general bulk are taken into consideration—is fully the equal of his heavier rivals as regards the amount of bone he possesses below the knee. As a case in point, Mr. Hume Webster refers to Mr. Alfred J. Smith's champion stallion Wedgwood, who at the time he wrote was five years old, and measured 7 feet 11 inches in girth, and $10\frac{3}{4}$ inches below the knee—a very considerable measurement when it is remembered that there is no hair included in the dimensions given, as there would be in the case of a Clydesdale or a Shire horse. Wedgwood, it may be stated, was foaled in the year 1886, and was the winner of championship both at the show of the Royal Agricultural Society of England, and many Suffolk county shows. The Suffolk, moreover, is credited with a very enviable reputation for being a good horse so far as the soundness of his feet is concerned, and consequently it is claimed for him that he lasts longer upon the stones of a town than any other variety that is put to the same class of work. In fact, so far as the wear and tear of his legs is concerned, the Suffolk affords a practical illustration of the fact that a great deal of hair upon the legs of a horse is no indication of special durability and soundness, for many a Suffolk will continue working at an age at which other heavy horses become worn out. Longevity, indeed, is one of the chief claims which Suffolk breeders insist upon making for their horses, and if half the stories that are told of aged animals retaining all their juvenile vigour for many years after they should in the usual order of things be long past work, be true—and there is no reason for doubting the numerous instances that are forthcoming on the subject—the Suffolk's term of usefulness is certainly a prolonged one.

The extreme docility of the breed is another great point in its favour, as it is something for an owner to feel that he is possessed of a strain of horses that rarely, if ever, develop vice, but on the contrary are usually endowed with the sweetest of tempers and generosity. That the Suffolk is a very willing horse is rendered quite apparent by a visit

to any farm upon which he is employed. Unlike many chestnuts, too, the natural gameness of the Punches is not neutralized by hot-headedness or vice of any kind; on the contrary, they are a somewhat phlegmatic-dispositioned variety, though they possess an amount of courage which enables them to face and endure the hardest of work. The Suffolk, moreover, possesses another great recommendation; he is an animal that requires very little breaking, as he takes to work almost as naturally as a duckling faces water. Above all things he is an agricultural horse, but where pace and strength combined are required, as in the case of town work, he is equally at home. Beyond all doubt, he is the most nimble and active of all the so-called heavy varieties; whilst, as has been stated before, the Suffolk, for his size, is a very small feeder, and will flourish and look well upon an amount of food that would be totally insufficient for many other big horses. As an instance of the longevity of the Suffolk horse, it is stated in the Society's Stud-book, that at one of the earliest exhibitions held by the Suffolk Agricultural Society, a brood mare aged thirty-seven years was amongst the competitors, and at that time she was accompanied by a sucking foal. So far back, too, as the year 1813, Arthur Young, in writing of this variety of horse, alluded to the fact that Mr. Wright, of Rockfort Hall, had seventeen of them in his possession, and that during the space of ten years he had not added one to his stud except a stallion. Julian's Boxer travelled as a stallion for twenty-five seasons; the dam of Lott's Cupbearer, owned by the Rev. O. Reynolds of Leabach, was one of the sixteen foals which her owner had bred from her dam in sixteen successive years; and the mare from which Rising Star, the first-prize horse at Leeds in 1861, was bred, was twenty-two years old when the colt was foaled. The above are a few instances of the longevity and vitality of the Suffolk horse, and these could be multiplied many times were it necessary to do so; but enough has probably been written to convince the reader, if he were unacquainted with the fact before, that the variety now under consideration is a very remarkably long-lived and fruitful one, in addition to being a very willing worker.

The head of the Suffolk Punch shows more breeding and quality about it than that of any other heavy horse, a very conspicuous feature being the eye, which is full of expression, yet mild and intelligent-looking to a degree. The neck is powerful and well formed, and the crest beautifully turned. The head-piece is well carried, the shoulders, which are very long, lie rather forward, this being desirable for the purposes of draught. The chest is wide and deep, the girth of the middle-piece being very considerable, whilst the body as a whole is long and substantially built.

The back is very strong, the hind quarters long and heavy, and close-coupled with the loin; the legs standing well under the body. The fore-legs—a very essential point, for however good an animal's top may be, he will be worthless if he has not legs and feet to carry him—must be short, flat, and possessed of plenty of hard bone, big at the knees and free from feather, whilst the pasterns are short and powerful, with little hair on them, the feet being of a good size and truly shaped. In height the Suffolk should stand from 15 hands 3 inches to 16 hands 2 inches at the shoulder, as if he is smaller he will lose power, and if bigger he is likely to be deficient in that symmetry and compactness which are so characteristic of the breed. So much space has already been devoted to the question of colour that it is unnecessary to refer to that question again, beyond remarking that it is imperatively necessary that it should be chestnut of some shade or other, but preferably the deeper ones, and the less white the better. In general appearance the Suffolk Punch is very happily described in the Suffolk Stud-book as being long, low, and wide, and this summary of his outline cannot possibly be bettered.

Considerable importance, and very properly too, is attached to the action of their horses by the breeders of Suffolks, who for the most part are united in decrying the presence of a high-flying action in a heavy horse. In the words of the official description of the variety, which cannot possibly be improved upon: "The Suffolk horse is an excellent mover, with a smart, quick step, a true balance all round at the trot, and a capital walker". As may naturally be supposed, an ultra-high flashy action is not desired, and it is naively added that "a horse weighing a ton bending his knee up to his throat latch, and striking the granite with his feet like a sledge-hammer, is not an exhibition that the Suffolk farmer has any delight in". In fact, a Suffolk that is heavy enough for the largest dray is seldom if ever called upon for an exhibition of speed and high action; even if he is only up to ordinary railway delivery-van work he is never likely to be wanted to go more than seven or eight miles an hour, and this class of animal will never scale a ton. As Mr. Hume Webster alleges, there can be no doubt that the old variety of Suffolks were famous not only for their nimbleness of action but for the honesty of continuance with which they would exert themselves at a dead pull. He also added, with pardonable pride—for in his lifetime he was a most enthusiastic admirer of the Punches—that the Suffolks of his day (1891) did not belie those great qualities of their ancestors. They are good drawers, and will continue to tug again and again at a dead pull without any need of the whip. The pure-bred Suffolk needs no whip, but at a signal from his driver

will be almost down on his knees in a moment, and will not be beaten by any reasonable load.

No doubt the weight and size of the modern Suffolk have been increased to meet the requirements of the market, but they still continue to retain the activity and action which distinguished their ancestors in the past. With so much to recommend them, therefore, it is not surprising that, in spite of the obstacles that oppose them owing to the established popularity of other heavy breeds, the Punches are steadily, though perhaps slowly, making headway amongst agriculturists both at home and abroad. The parcels delivery companies, which require active yet powerful wear-and-tear animals of robust constitutions for their trade, are always glad if they can get possession of any of the lighter specimens of the breed. Whether the Suffolk will ever reach the position of the most favoured heavy horse is perhaps a matter of considerable doubt, but to those who require for their work a fast, active, good-tempered, and good-constitutioned draught-horse, there is no gainsaying the fact that they might do far worse for themselves than by giving a chance to the handsome and long-lived Suffolk Punch, whose antiquity alone may commend him to their consideration.

FOREIGN BREEDS

The Arab.—There is unfortunately no room left for doubting that the Arab horse has suffered much through the mistaken and excessive partisanship of over-zealous friends. The lavish—one might almost adopt the expression fulsome—flattery of which he has been the victim has certainly alienated from him the sympathies of many a practical man; whilst the hysterical and childish allusions to this, in very many respects, most valuable horse as the "courser of the desert", the "Arab's faithful steed", and such like sentimentalities, are, though possibly welcomed by the readers of improving works for the young, very far from calculated to attract a business man who wants his horse to use and not to gush over. In fact, had it not been for the existence of a small body of practical supporters of the breed, who have laboured in a serious manner to benefit the horse, there is good reason to believe that the Arab would have been to all intents and purposes non-existent in this country by now; but even as matters are, the position occupied by him is very different from that which should be occupied by the horse to which the Thoroughbred is indebted for many of his excellencies.

This admission is not exactly complimentary to the gratitude of English breeders, but a very reasonable excuse exists for their desertion of the Arab in the fact that the majority of his supporters appear to be so perfectly

satisfied with him as he is, that very few of them have done anything to improve him by selection. No attempts appear to have been made to improve his speed, or action, by a series of inter-Arab crosses, the great aim of his admirers having been to obtain the blood of certain families; and having achieved this object, the majority of them seem to have been content. It is true that the Arab has increased somewhat in stature, as all breeds of horses do which receive the benefit of a residence in England, the climate of which, to say nothing of the high feeding, undoubtedly produces size; but in this respect the Arab has not been improved, in the opinion of some authorities, though many persons possessing open minds upon the subject entertain the belief that he might have been made better than he is.

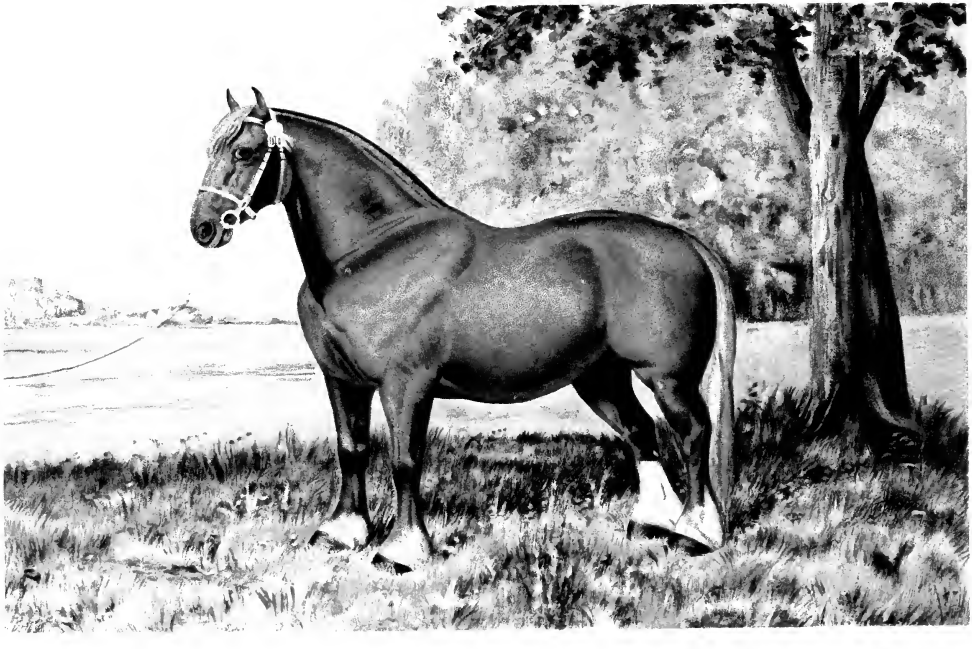
Notwithstanding the above remarks, the writer does not desire it to be imagined that he is to be included in the ranks of Arabphobes, but, on the contrary, in the category of well-wishers of the breed. The Arab, in his proper place, is beyond all doubt a most valuable and useful horse, which is worthy of being appreciated far more highly than he is, and which has not exactly received fair-play from his opponents, who, quite forgetting what he has done for horseflesh in this country, have been disposed to depreciate his merits because he has not been proved the possessor of all the accomplishments claimed for him by over-zealous advocates. If only on account of the antiquity of his lineage the Arab is entitled to respect, for, although very few persons will be found to accept the theory that this was the breed selected by Noah as "the best" to accompany him in the ark, there is no doubt at all that this horse has been an inhabitant of the desert for centuries, and that his Arab owners have guarded the pure blood most jealously. It is true, of course, that no written records are forthcoming to prove the authenticity of early Arab pedigrees, but it must be remembered that in the East it is the custom to accept oral evidence, and there is no reason whatever for disbelieving such pedigrees of imported horses as have been carefully investigated and enquired into by experienced persons on the spot.

The Arab, according to all the authorities best qualified to judge, is descended from five mares, namely, Keheilan, Seglawi, Abeyan, Hamdani, and Hadban. From these, other families have sprung, but the blood of one or other of the above mares runs in the veins of every animal which in the remotest degree can claim to be regarded as an Arab. No doubt the families have occasionally been interbred, but this circumstance would not affect the right of the offspring to be regarded as a first-class pure Arab, and prized accordingly; and when such unions have occurred, the foal has been included in the family of its dam; thus

a colt by a Seglawi horse and a Keheilan mare would be styled a Keheilan, and would rank as a first-class Arab of untarnished pedigree. On the other hand, if a mare belonging to this class should be mated with a horse of inferior blood, or in any respect other than a member of her own rank, she and her foals are at once transferred to the second class; whilst the third class is composed of animals which, though possessing relationship with the highest order, are still further removed from them in blood, mis-marked foals of good breeding, and the like. Affixes are used to denote the best specimens of the five great families, and are also applied to the animals of the second class. As may be supposed, sub-families have sprung up which have taken their names from their founders, such as the Seglawi Jedran, one of the most sought-for classes; and though, perhaps, the Keheilans are the most numerous, the best type of Arabs is the Nejdean, though it is becoming rare.

Many owners, of course, possess specimens of all the five great Arab families alluded to above, and Lady Anne Blunt, in her charming work, *A Pilgrimage to Nejd*, alludes to the fact that in the stables of Ibu Rashid at Haïl, which she went over several times, there were mares of the following families:—Keheilet el Krush, a 14 hands 1 inch chestnut; a bay Hamdani Simri; a young Seglawi Sheyfi; a 14 hands 2 inch dark bay Keheilet Ajaz; and a gray Seglawi Jedran, &c. These mares, it will be noticed, all belong to the family of one of the five mares—or "Al Kamsch", as they are termed in the desert—whilst the affixes show the name of the breeder who founded the sub-family in which they are included. Thus Seglawi Jedran implies that the mare is of the great Seglawi family of Jedran's strain.

In height the mares found by Lady Anne Blunt in the stables at Hail were certainly below that which would recommend them to English judges of insular ideas; but, as stated above, a very great increase in stature is observable amongst many animals of undoubtedly the purest desert blood in this country, where Arabs of 15 hands 3 inches are not unknown; similar cases have been reported from Hungary, where these horses are much appreciated. It is therefore incorrect to stigmatize the Arab as necessarily being a little horse, though many good judges prefer him small; and it is also a libel on the breed to reproach them with being light in bone. Of course, as in the case of all varieties, some Arabs are not so massive as others; many appear to be far slenderer below the knee than they really are, this fact having impressed itself very strongly upon the mind of the writer when he, quite unknown to the owners, some of whom he had never seen, measured the girth of the fore-legs of the competitors at the Crystal Palace show in 1896. In



another respect the bone of an Arab is admittedly unsurpassed by that of any other breed of horse, and that is in its quality, as for density, fineness, and elasticity it is perfect, and hence, no doubt, the immense value of an Arab cross to certain breeds which are the victims of coarse, spongy bone. The Arab is also to be commended for his charming temper; excitable and spirited he is, no doubt, but vicious horses are very rare, in fact almost unknown, and a few soothing words, even from a stranger, if he understands horses, will usually quiet the most ruffled feelings.

It has been remarked above that few serious attempts appear to have been made in this country to improve the speed of the Arab by scientific breeding, Mr. Wilfrid Blunt being a notable and honourable exception. The Arab also has seldom been subjected to a proper course of training, and the performances of some representatives of the breed when matched to run against Thoroughbreds at Newmarket can scarcely have been accepted as encouraging to Arab owners to persevere with them on the turf in this country. In India, however, Arabs run very well, and successfully carry big weights over long distances of ground in good company, their stamina being as pronounced as it is remarkable, considering that the chief grain they are fed on in their native land is barley. There are, however, many other uses for the Arab quite independent of racing, and it is surprising in the first instance to consider how his qualifications as a saddle horse have been ignored by the public. Detractors of the horse take exception to his shoulders, which certainly, as in all other breeds, are not invariably so good—that is, so long and sloping—as they might be; but in the case of the Arab the muscular development at this point is very great, and this circumstance not infrequently causes wrong impressions regarding the form and character of his shoulders. Moreover, those who try one generally pronounce an Arab a good ride; and it must not be forgotten by his detractors that he has never been subject to the degradation of leather by his owners in the East, but has been used as a saddle horse from time immemorial. His big quarters, well-shaped, springy pasterns, and light head specially qualify the Arab for saddle purposes; and therefore, as he can jump well and stay, these properties, combined with his usually perfect manners, should cause him to be sought for as a lady's hack or lightweight hunter.

As a cross for many other breeds the qualifications of the Arab are undeniable. Through the male line, at all events, he has given us the Thoroughbred, and probably the old Pack-horse, and through the latter the Hackney, and other breeds—two of the finest movers whose names

appear in the Hackney Horse Stud-book, namely, Movement and Magpie, strain back on their dam's side to an Arab—and even upon these grounds it should be impossible to ignore his merits. Nor has the Arab been subjected to a course of treatment and training, such as that bestowed upon the Thoroughbred, which is calculated to impair his soundness. In the desert he is brought up hardy enough—Lady Anne Blunt reports having seen the choicest mares of the Haïl stud standing in the open tethered by one foot to brick mangers, and covered with rugs, no shelter of any kind being provided for them; and in this country, to their credit, owners rarely coddle their Arabs. Consequently, when a breeder is anxious to impart quality, stamina, and constitution to his horse, speed and height at shoulder being secondary considerations, the Arab is more likely to produce these, and less likely to transmit infirmities than the Thoroughbred. As a sire of Polo ponies the Arab has done very well indeed, his stock having pace, alertness, intelligence, and manners to recommend them, whilst his first crosses with Suffolk horses have proved themselves big-framed, neat-headed, good-quartered, very useful animals, which look like carrying weight to hounds.

The head of an Arab is of good size so far as the upper portion is concerned, being rather long from the ears to the eyes, and wide across the forehead, which should be convex and not flat, this being regarded as a fault. The ears are fairly long, fine, and pointed; the eyes not too full and soft in expression, but capable of showing excitement when aroused, the face often denuded of hair for a small distance round them, which gives them the appearance of being circled with rims of dark-coloured skin. The lower part of the head tapers suddenly towards the muzzle, which is very fine and imparts a blood-like appearance to the head, whilst the lower lip projects slightly. The neck is very powerful and nicely arched, with the throat well developed; the chest rather narrow, but deep, with the ribs swelling out behind the forearms, which causes the girth to be considerable; the back short, and the loins and quarters extremely powerful. The forearms are long to the knee, but the canons below are short; the pasterns long and springy, and the feet deep and sound. The thighs are big, and the joints all round should be well formed, the skin and coat being soft and silken respectively. The tail of the Arab should be set on high, and carried, as has been suggested, like that of a rocking-horse when at repose, but when the animal is excited it is raised somewhat. The position and carriage of the tail are points much considered in the East, and it is believed by some persons that the tails of young foals are twisted into the desired shape if they appear likely to be carried low. Colours vary in the Arab,

bays, chestnuts, grays, and browns being all found amongst pure stock; but blacks, roans, and skewbalds are tabooed. The Emir Ibu Rashid, the owner of the Haïl stud, according to Lady Anne Blunt, preferred a bay or a chestnut, whilst many persons would rather possess a white with black hoofs, but it is worthy of remark that of the hundred mares at Haïl forty were grays or whites, thirty bays, twenty chestnuts, and ten brown, which may fairly be taken to represent the usual proportion of the colours.

The Percheron.—The Percheron is the best known and most valuable of the French breeds of horse, and is certainly of ancient extraction, though it is doubtful whether, as some persons are inclined to believe, the tap-roots of the variety were brought into France by the Crusaders who returned from the Holy Wars centuries ago. It is probable, however, that the Arab had a share in the production of the Percheron; and so far back as the year 1760 it is suggested that the Eastern stallions were utilized by Count Mallart for the service of mares belonging to the Coesme stud, over which he presided. Subsequently, however, the English Thoroughbred appeared upon the scene, and took the place of the Easterns; but in 1820 two gray Arabs arrived in the district and were largely bred from, and to these horses it is generally believed that the modern Percheron is indebted for his gray colour. There is, however, reason for believing that the old blood has pretty well died out, for the department where they originated is only a small place, and as mares and other stock were disposed of, their places were supplied by importations from Brittany and elsewhere, the result being that the old strain became mixed.

The fact, too, that the Percheron exists in three types, or perhaps grades would be the better expression—heavy, middle, and light—goes some way towards confusing the modern seeker after information as to what the original stock was like. It is reasonable, however, to assume that the original Percherons were of the class of animal that was adaptable for stage-coach work, and that as these vehicles became ousted from the service of the public by railways, the breeders of the district applied themselves to the production of a heavier class of animal which could be used for van and light agricultural work. In support of this contention there is the fact that within the past fifty years heavy mares, and stallions too, were brought into this district from Brittany, Picardy, and Caux, and these, no doubt, were crossed with the remaining Percherons. With the view of stopping the further contamination of the old blood, a local Horse Association was established, but it does not appear to have effected much good, as the attempt made to sustain the old light type by insti-

tuting trotting competitions simply had the effect of attracting English trotters, though it may be added that some excellent performances are attributed to Percherons located in the department whence they take their name. Indeed the chief merit which is claimed for the breed is the faculty for trotting fast in front of a comparatively heavy load, while the constitution of a Percheron is described as being most robust, his temper excellent, and his endurance and precocity both above the average. As regards his endurance, however, opinions differ very decidedly, as many who can speak with authority consider that the breed is soft.

In height a Percheron ranges from 15 to 16 hands, and at the present day he is more often to be found of the middle than of the light or heavy type. His head is rather large, the forehead wide, the eyes rather full; his neck is short and massive, and is adorned by a very full mane; his withers high; and his shoulders of fair length, and set back. He is deep in chest, and somewhat round in barrel; his back being inclined to be long, whilst his tail is set on high. His legs are short, but the tendons below the knee are rather weak. The prevailing colour is gray, but the opinion has been expressed that it would be desirable to attempt to change in this respect to bay, but how this could be accomplished without a further and possibly fatal encroachment upon the purity of the breed, such as it is, it is difficult to see.

It has already been stated that Percherons of the middle degree of stature and development are the most common; but it may be added that the light-framed type is usually to be found in the Norman portion of the district, such as Courtomer, Moulins la Marche, and Aigle; whilst the chief stronghold of the heavy type is in the neighbourhood of Forte Bernard, Saint Corme, and Maniers.

The Hanoverian Horse.—Probably most persons who know that His Majesty's Creams which are attached to his carriage on great state occasions are of Hanoverian blood, are quite unaware that there is, or at all events was until recently, a breed of equally valuable white horses in the royal stables of Herrenhausen. No doubt the national emblem of Hanover—a white horse—was derived from this ancient breed, which was utilized for drawing the king on state occasions, just as the creams, or "Isabels" as they are styled in their own country, were pressed at the same time into fulfilling a similar duty to the queen. Whence these two breeds originally came, the writer was unable to ascertain when he paid a visit to the Herrenhausen stables, as the memory of the oldest retainer belonging to the establishment was a blank upon the subject; but there are very good grounds for believing that the creams are descended from an ancient Danish breed of that colour. Their antiquity, however, is

unquestionable, and what is more, both varieties breed perfectly true to colour; and a most remarkable peculiarity of the white horses—"white-boned horses" as they are known in Hanover—is that the foals are all thrown absolutely white, a fact which was proved by the existence of one only a few hours old in one of the boxes at the time of the writer's visit to Herrenhausen.

Irrespective of their unusual colour, their antiquity, and the fact that until Hanover ceased to exist as an independent state, the whites and the creams were respectively the horses of the king and queen, there is nothing extremely remarkable about them. They were all tall, powerful animals, rather inclined to coarseness, and not particularly good about the shoulders, but no doubt serviceable if put to work, which, however, they very rarely were. Their tails, which were squared, extended down to their heels, and their manes were correspondingly long. They are stated to be an extremely long-lived breed, and as the founders of the sovereign of England's stud of state horses, will always be regarded with feelings of deep interest if not of veneration by his loyal subjects.

The Morgan Horse.—This is an American production in the shape of a harness horse, the precise origin of which is obscure, though, according to all accounts, it is descended back to a stallion named Justin Morgan, which was the property of a resident in Randolph, Vermont, whose name he bore. This horse appears to have been foaled somewhere about the end of the eighteenth century, but the date of his being dropped and his pedigree are alike matters of pure conjecture in spite of the many attempts which have been made to ascertain the facts concerning him. Perhaps the consensus of opinion tends to show that Justin Morgan originally came from Canada; but this theory is opposed by many persons on the grounds that the Canadians are not so easy in their action, though, on the other hand, they possess more durable feet.

The Morgan horse is claimed to be the possessor of stamina above the average, and is therefore described as being "entitled to the appellation of a fast traveller", as a good one can cover a great number of miles a day and keep up a good pace. As a useful harness horse, with moderate weight, the Morgans were highly popular some forty or fifty years ago in their native State, where they possess many admirers even now. They are not a big breed, the usual height being from 14 to 15 hands, the prevailing colour being bay. In make, the Morgans are round and heavy, with lean heads, wide and deep chest, the fore-legs are set well apart, clean and sinewy, besides being strong, and, as a transatlantic authority on the breed observes as to make and endurance, they have "that projection of ribs from the spine which is a sure indication of

powerful lungs, and consequently of great wind and bottom". No doubt about the middle of the last century the Morgan horses were extremely popular in America, though not adapted for great speed at short distances; but as little, if anything, is now heard of them nowadays outside the State of Vermont, it is evident that they have not succeeded in maintaining the reputation which they then possessed. Of late, however, these horses appear to be receiving more attention from American breeders.

The Oldenburgh.—This breed, which is raised in the district of Germany from which it takes its name, may be regarded as, upon the whole, the most valuable of all the Continental varieties of heavy carriage horse. At all events many—far too many—scores of Oldenburghs are to be seen in the Park every London season, as British dealers, despairing to find the stamp of horse that is required for landau work in the home market, are compelled to patronize the foreigners.

Without, however, laying one's self open to the reproach of being narrow-minded and insular in one's views, the opinion may be expressed that, showy and imposing as the Oldenburghs are, they do not possess the bottom and the stamina of Hackneys, Cleveland Bays, or Yorkshire Coachers. On the other hand, they fill the eye as extremely fine-looking barouche or landau animals, for though, as a rule, they may not possess the finish about the head of the Yorkshire Coacher or the Hackney, or the quarters of any of the British Harness breeds, they carry themselves for the most part very boldly, have fine middles and plenty of bone, and are almost invariably very good indeed in colour, a gray or a chestnut being a rarity amongst them.

Beyond all doubt the Oldenburgh is an ancient variety of horse, indeed it is claimed for the breed that it has been in existence for over three hundred years, and no doubt the tap-root from which the modern Oldenburgh has descended must have been alive somewhere and in some form at an earlier date. This admission does not, however, go the length of suggesting that no foreign blood has been introduced into the old strain whatever it may have been; and the appearance of the Oldenburghs very strongly suggests the presence of Hackney and Coacher blood. From the former, beyond all doubt, the fine action which is characteristic of the German horse has been derived, and it is extremely probable that the Coacher gave him size and quality, the latter through the thoroughbred blood the Yorkshire possesses, and very likely colour as well.

Whilst upon the subject of colour, it must be admitted with feelings akin to shame, that Continental horse-breeders are far in advance of the Englishman in this respect. They have from the first realized the fact

that bays and browns are the colours most in request amongst those who use big horses, and chestnut the least popular of all; and it is mainly to the fact that our foreign rivals can supply the public with what the latter want, that British horse-dealers can find in Germany and elsewhere the class of animal which is so very scarce at home.

In addition to size and colour the breeders of the Continent have aimed at the production of action and style, and these they certainly have secured; as for his height and weight, the Oldenburgh possesses both these characteristics, the latter to a marked degree. Opinions differ as to whether the constitution of this horse is robust or not, his foreign breeders averring that it is; but people who have experience of him in this country are by no means unanimous on the point. Moreover, it may be repeated that, though there are exceptions, the Oldenburgh, horse for horse, does not possess the endurance of the British breeds from which he is descended; but for park work he is well adapted, and hence his frequent appearance in the equipages of the highest in the land.

The Holstein.—The district in which this horse is produced is easily ascertained from the name borne by the variety, which, beyond a doubt, is a very ancient one. Indeed it is claimed on behalf of the Holstein that several celebrated studs in Germany, Spain, and Italy have descended from representatives of this breed which have been imported into these countries, and it is practically certain that this horse was the tap-root from which the Hanoverian breed originally sprang.

The origin of this variety, it must be candidly admitted, is obscure, but it appears almost certain that it contains a strong strain of Eastern or thoroughbred blood, as the head is usually particularly neat for a big horse; whilst the middlepiece, quarters, and short legs, to say nothing of the free action which many Holsteins possess, denote the probability of a Hackney cross. It may also be observed that the Holstein Stud Book can claim to be the oldest publication of its kind in Germany, having first appeared in 1886, which fact goes some way towards proving that the merits of the breed are highly appreciated. It must not be understood, of course, that there were not previous registers connected with the Holstein horse, for there were such in existence, and these contained references to the breed which dated back for a century or more.

As regards his appearance, the Holstein may be referred to as a horse of good height, with bone and very fairly high action, though his dash is inferior to that of the Hackney. He is rather breedy-looking for his height, which fact renders him a desirable animal in the eyes of those who admire a powerful weight-carrying saddle-horse of the Continental

type, though the Holstein is scarcely the average Englishman's idea of the correct stamp of riding animal.

The Schleswig.—The Schleswig horse is a totally different class of animal from the Holstein, inasmuch as he is distinctly of the heavy, cart-horse type. He favours the Suffolk stamp, however, far more than he does the Shire Horse or the Clydesdales, being clean-legged like the first, and less bulky than either of the others. Considering his proportions the Schleswig is an active, nimble breed; so, whilst the most useful for the purpose of agriculturalists on light land, he is far better adapted—assuming that he is not soft—for such military work as the Artillery and Commissariat Departments require, as well as for vans and omnibus traffic.

Although there is no direct evidence to prove the correctness of the theory, it is highly probable that the ancestry of the Schleswig horse is connected in some way with that of the French Percheron, as the two breeds possess several features in common.

The East Friseland.—This is a big, useful variety of Continental horse, the home of which lies north of Oldenburgh, and is bounded by the North Sea. The East Friseland breed may be regarded as occupying a position in the equine world of Germany somewhat analogous to that filled by the Cleveland Bay in this country, as he may be described as either the lightest of the agricultural breeds or the heaviest of the light harness varieties of his native land. He is an animal that develops very rapidly, so much so, indeed, that many of his breeders, if they happen to be farmers, will make use of him when he is three years old for light work on their holdings, but when he arrives at the age of four they part with him to dealers for landau and other such duties if he shows action and style enough.

During the past century the old East Friseland has been fined down a good deal by crossing with blood-horses and steppers, and hence his value has increased in this country, where many of the best-looking specimens of the variety are to be found in the heavy carriages of wealthy people.

HEALTH AND DISEASE

For a description of the Various Drugs, &c., mentioned under "Health and Disease", and the doses to be administered, the reader is referred to the subsequent section—"Veterinary Medicines: their Proper Employment".

SECTION IV.—HEALTH AND DISEASE

1. INTRODUCTORY

Health, using the word in a definite sense, is a theoretical condition; it implies perfect correspondence of the organism with the surrounding conditions, and its maintenance includes perfect adaptation of any changes which may occur in either or both. What Mr. Herbert Spencer says of life may be paraphrased so as to apply accurately to conditions of health. Perfect correspondence would be perfect health. Were there no changes in the environment but such as the organism had adapted changes to meet, and were it never to fail in the efficiency with which it met them, there would be unimpaired and perpetual health. That these conditions do not exist in nature is perfectly obvious, and in speaking of health various and modifying terms are used to indicate degrees of health without suggesting the actual existence of disease. If there were an absolute standard of health there would be no difficulty in defining disease; but in reality there is no distinct boundary line, and the transition from health to disease may be so gradual that it might not be possible to say where the one ends and the other begins.

Disease may be taken in a general sense to mean any disturbance of the structures or functions of a living being. The derangement may be *acute* when it is severe and rapid in its progress; *chronic* when it assumes a lower type and is disposed to continue; *sporadic* when it is the result of ordinary causes arising from without, as exposure to climatic changes, insufficient or impure food; *epizootic* when it extends to a large number of animals at the same time as the result of some cause which is generally distributed; *enzootic* when it affects a number of animals in a particular locality owing to local conditions; and *recurrent* when it exhibits a tendency to return after the affected animals have apparently recovered.

The science of pathology teaches that the strict meaning of the term disease, or loss of ease, cannot consistently be retained in reference to many morbid conditions because they do not necessarily produce any discomfort, and can only be considered as disease for the reason that they are

a departure from the ordinary normal or healthy condition of the structures or functions. Certain forms of bony tumours which occur in situations where they do not interfere with the mechanism of the skeleton, and are unattended with pain or inconvenience, may be referred to in illustration of this proposition.

Pathology includes everything connected with a departure from health, and implies, therefore, a wide range of knowledge in regard to all the circumstances under which structural or functional changes are developed. *Etiology* is a division of the science of pathology which relates to the causes of disease. *Semiology* refers to symptoms or indications, or, in other words, to the external expressions of a morbid condition. *Predisposing* causes are those which, as the term implies, act injuriously upon the organism and render it liable to the influence of more energetic causes. Various circumstances of an ordinary kind, such as changes of temperature, exertion, quality and quantity of food, the impurities in the atmosphere, age, sex, conformation, temperament, and hereditary disposition may all be classed as predisposing causes of disease. *Nosology* is the classification of disease. *Diagnosis* implies the accurate definition of a disease, its position, nature, and localization. *Prognosis* relates to the probable termination of disease, or the expression of the opinion of the observer based upon his diagnosis; its value necessarily depends upon his experience of the course which the disease has taken in similar cases, or upon the accuracy of his judgment in regard to the actual morbid changes in the structures or functions in the particular case under consideration.

ETIOLOGY—CAUSES OF DISEASE

The most obvious and at the same time the most simple and practical classification of causes of disease is the division into *Predisposing* and *Exciting*. This classification includes at once nearly all that can be said on the subject of causation. Various subdivisions are for convenience employed, but they all relate as a matter of necessity to the two primary divisions, for example, *extrinsic* and *intrinsic* causes, in other words, causes acting from without and those which arise within the animal body and which may either increase the tendency to acquire the disease or may actually cause its development. *Specific causes* occupy a position which in some degree disconnects them from ordinary causes whether predisposing or exciting. The term specific indicates that there is something peculiar to be taken into account, and at the present day the term is limited to those causes of disease which include some particular micro-organism or some specific poison, which may be either extrinsic or intrinsic.

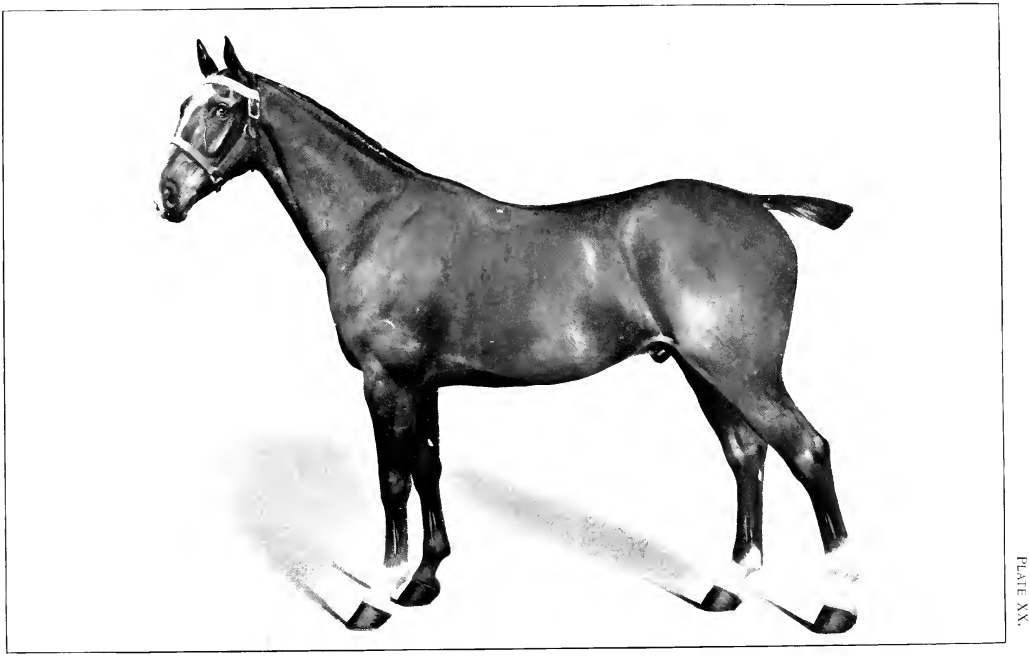


PLATE XX.

HUNTER. TENNIS BALL

Bay gelding by Court Ball, dam Express 2589 by Delight. Winner of numerous prizes
The Property of H. M. Mackusick, Esq.

PREDISPOSING CAUSES OF DISEASE

The predisposing causes of disease are generally subdivided under several headings, which may begin with the hereditary constitution, which is the most prominent and important, then temperament, age, sex, &c.—these are all intrinsic, existing within the body independently of any influence from without; then follow a number of extrinsic predisposing causes, such as excitement, occupation, and conditions which induce debility.

Excitement may be looked upon as a predisposing cause of disease when it leads to excessive development of activity in the circulatory and nervous systems associated with general or systemic excitement—a condition which may stop short of actual disease, but is especially favourable to the action of any exciting causes which tend to set up inflammation. In a state of general excitement the system is liable to suffer from any febrile disease which may be at the time prevalent, or from sudden exposure to violent changes of temperature, which may lead to an inflammatory attack. Certain forms of local excitement lead to the determination of blood to a particular part, which may end in the rupture of vessels, or may increase the functional activity of a part and thus render it liable to any influence from without or within which may induce congestion or inflammation.

Excitement may in itself result in the development of active inflammatory disorders without the intervention of any extrinsic cause, in which case it would be classed among the exciting causes of disease. For the present purpose it is only to be looked upon as acting to a sufficient degree to render the system susceptible to disease without actually inducing it. It is in the nature of things, in fact, that predisposing and exciting causes very frequently approach each other so closely that it is impossible at all times to distinguish the one from the other.

Debilitating influences, whether arising out of insufficiency of food or feeding to excess, will both have the effect of reducing the vital energy, and in this way diminishing the power to resist disease. Insufficient food is the most common cause of debility acting in a perfectly intelligible way, not only by a failure to supply a sufficient amount of nutriment to compensate for the waste of the tissues, but further by inducing a feeble condition of the digestive powers as a mere consequence of inactivity. Excess of food induces a similar result through the medium of the opposite conditions, the nutritive functions become impaired as the result of congestion of the vessels which supply the digestive organs with blood, and consequent overwork and derangement of the secretive and excretive processes. Further, mischief is done by an excess of nutritive material beyond the amount which the system is capable of appropriating, the excess

being converted by oxidation into certain animal alkaloids and extractive matters, which exercise a deleterious influence on the organs and functions of the body. Next in importance to the influence of excess or deficiency of food, bad quality may be considered, the immediate effect of which will depend upon the particular constituents which occasion the deterioration. Products of fermentation, growth of fungi (moulds), decomposition, which implies the presence of septic microbes, may render food of bad quality actively poisonous or positively pathogenic, and in such cases it would come under the head of an exciting cause of disease; but short of being actively poisonous or disease-producing, the changes induced in it may merely have the effect of weakening the system without actually producing obvious disease.

All that has been said in reference to the effects of food may be applied to water, which, indeed, may be taken as representing a portion of the food.

Impure air exerts a remarkable influence upon the health of the body in two directions: (1) by failing to supply the proper amount of oxygen for the purpose of respiration and the purification of the circulating fluid; and (2) by introducing into the system organic and inorganic substances which may gradually assist in disturbing the nutritive functions and lowering the vitality of the body as a whole.

Exertion.—Exercise is a recognized necessity for the maintenance of all the functions of the body, including the mental functions, which are not of first importance with regard to the lower animals. As in the case of food, exercise may be beneficial or injurious according to its amount. Excessive exertion is perfectly well known to be followed by exhaustion, which is necessarily associated with loss of tone in the system and liability to disease. Failure of circulation in various parts will induce congestion and the accumulation of deleterious matters in the blood, and in this condition the body becomes remarkably subject to disease. On the other hand, want of exercise leads to a sluggish condition of all the functions, loss of muscular power, weakness of the heart in common with other muscular structures, feeble circulation, local congestions, inactivity of the respiratory functions, accumulations of fat, and what is perhaps of even more importance, an inactive state of the excretive organs which permits the accumulation in the blood of various deleterious products resulting from imperfect oxidation, which under a healthy condition would be rapidly eliminated from the system.

Temperature has a marked influence on the various functions of the body; heat causes debility by its stimulating influence upon the circulatory, respiratory, and nervous functions, the excessive activity being naturally followed by relaxation and exhaustion.

Excessive cold produces debility by its immediate sedative influence on the system, and the repellent effect of cold upon the surface diminishes the circulation in the superficial vessels of the skin and leads to an accumulation of blood in some of the internal structures, acting particularly upon some parts of the digestive and circulatory system. Its influence upon the nerve centres, whether it is direct or indirect, is shown in the rapid diminution of the vital powers of resistance, a condition which is eminently favourable to the action of exciting causes of disease.

Heredity.—Of the existence of a tendency to disease transmitted from parents to offspring no doubt can be entertained; whether the predisposition so conveyed be called idiosyncrasy, constitutional peculiarity, remarkable liability, or special receptivity, or be designated by any other form of words, the fact remains that the influence of heredity has always been recognized, although the term itself may not have been used by the older writers. It may be defined as the law of inheritance not necessarily limited to the transmission of a tendency to disease, but applying equally to everything which belongs to the living organism, every quality, indeed, whether good or bad, whether relating to mental functions or to organic structure. A modification in the character of organs due to the manner of their employment in a former generation has often been observed; thus large hands are inherited by people whose ancestors led laborious lives, while small hands belong to the descendants of those who have not been compelled to follow occupations which require manual work. In the course of the observations made by Darwin many instances are mentioned of the appearance of peculiarity of structure and of certain diseases at particular periods of life in certain families, and among the cases quoted are blindness occurring in a family and being transmitted to twenty-seven children and grandchildren, the affection beginning always between the fifteenth and sixteenth year, and ending in a total loss of sight at the age of twenty-two. Also of insanity in a family affecting grandfather, father, and son, who all became insane and committed suicide at the age of fifty; in fact, the evidence offered by biologists in favour of the remarkable influence of heredity in continuing a tendency to certain diseases is so complete that it is impossible to question the fact. It is indeed perfectly well known that scrofula, asthma, rheumatism, gout, epilepsy, blindness, and deafness run in families—not necessarily in one continuous line, but commonly interrupted, even a whole generation being passed over, the disease appearing in the next.

Temperament.—In dealing with the predisposing causes of disease, certain types of temperament are defined. The *sanguine* temperament refers to animals of a lively disposition with active circulation and quick

movement, a condition of system which produces a disposition to inflammatory diseases. The *lymphatic* temperament, sometimes described as phlegmatic, is exactly the reverse of the sanguine; it is associated with a feeble circulation, a deficiency of red particles in the blood, pallor of the mucous membranes, and coldness of the skin, especially in the extremities, and it predisposes the individual to chronic diseases of a low type. The *bilious* temperament is probably always connected with a want of activity of the liver and other parts of the digestive organs, which tends to depress the vitality. A *nervous* temperament is indicated by excitement alternating with depression, both conditions resulting in a predisposition to what are called nervous affections.

Age has a marked influence in developing or fostering a tendency to special forms of disease.

It is well known that the foal suffers from diseases to which the state of the organism and the circumstances of its life render it peculiarly susceptible. The young animal is liable to the effects of cold, which induces irritation or inflammation of internal organs. Very trifling errors in dieting—in the sensitive state of the digestive canal—cause severe, sometimes fatal, attacks of diarrhœa. The brain is easily excited, and the process of teething increases the liability to various febrile and gastric disorders.

In advanced age the horse is predisposed to rheumatic affections, stiffness of joints from the increasing density of the ligamentous structure, while the muscular powers are impaired from loss of the true contractile tissue and the increase of fibrous structure, and the steady decrease of the vital powers adds to the predisposition to diseases of a chronic type. It may, however, be affirmed that the influence of the different age periods in the horse in the production of predisposition to disease is not to be compared to the changes which occur in the system of the human subject at different periods in his far longer average life.

Sex as a predisposing cause of disease relates chiefly to the generative system, and in the lower animals the female is predisposed to affections due to gestation and parturition from which the male animal is necessarily exempt; but in other respects no important difference has been observed. Mares are not more nor less liable than horses to those affections to which the equine race is prone.

Occupation is quoted among the predisposing causes of particular diseases in man, and it is surely the case that horses are likewise rendered susceptible to maladies of a kind which are incidental to their occupation, *i.e.* the kind of work which they are required to perform. It is only necessary to compare the occupation of the hunter with that of the agri-

cultural horse on the farm, or the work of the carriage- or saddle-horse with that of the poor man's drudge, to realize that the position which the animal occupies, in other words the occupation as it would be termed in reference to man, exercises a very considerable influence on the susceptibility of the system of the horse to certain forms of disease: thus, race-horses are specially liable to sore shins; hacks, hunters, and harness-horses to splints and spavins; and cart-horses to side bones, &c. &c.

EXCITING CAUSES OF DISEASE

Those influences which have the power of acting upon the organism in such a way as to excite disease, especially in the system which is already predisposed, were formerly divided into cognizable and non-cognizable: the first section including all agencies the existence of which could be recognized independently of their action in producing disease, such as heat and cold; and the second referring to influences which were not recognizable, but the existence of which was inferred from the effects produced. In this second class all contagious and infectious influences, endemic or epidemic, were included. The system of classification of half a century ago has now become obsolete, but it is worth while to refer to it, because although comparatively recent investigations have proved beyond doubt that the cause of some of the most virulent infectious disorders are quite cognizable, there are other maladies which are endemic, epidemic, and in some cases contagious, which arise from causes the existence of which can only be inferred from the effects produced. The causes which are cognizable or apparent to the senses are mechanical and chemical agencies, food, exertion, excitement, excessive and defective secretion, defective ventilation and drainage, and climatic changes; and it is evident that several of these agencies, which have already been considered, are capable of acting both as predisposing and exciting causes—exciting when they become sufficiently intense to produce the disease to which their primary action only rendered the organism susceptible. Thus, errors in diet, excitement without exertion, excessive secretion, defective secretion, impure atmosphere, and changes of temperature may all act as exciting causes of disease. While they are placed among the predisposing causes—in fact whether the causes are mechanical or chemical in their character—they may be alternately predisposing and exciting influences.

Exciting causes of disease which are cognizable.—*Mechanical causes* are usually referred to in the first instance under the above heading, and they include all agencies which immediately damage the structures or in any way disturb the functions of an organ or any part of the body. The

most intelligible instances of the action of mechanical causes are seen in the effects of blows, sprains, and cuts, which at once produce derangements of parts, described as surgical diseases; but there are other mechanical causes acting with less intensity which may produce affections of the system requiring medicinal treatment—for instance, pressure on any part, although not in many cases productive of injury at the moment, may lead to considerable interference with the freedom of the circulation, and if continued, end by inducing organic disease. The cases in which this result is to be apprehended are numerous enough in the human subject, and the horse is by no means exempt from the consequences of undue pressure from portions of the harness. A notable instance is furnished by excessive and ill-regulated pressure from the saddle, which causes a condition known as wrung withers or galled back or saddle gall, and what is more serious still, the pressure of a badly-fitting collar, which interferes with the circulation of blood in the large vessels of the neck, inducing congestion of the brain, attacks of giddiness, or megrims, and even, under certain circumstances, causing an apoplectic fit.

Pressure on important organs may also be intrinsic in its character as a consequence of the growth of tumours or the deposit of mineral substances, as in the formation of calculi or stones in the bladder or bowels, &c.

Obviously, the pressure which is exerted by the formation of tumours or the deposit of calcareous matter will produce results gradually, and it is also evident that the importance of the disease which is induced will depend entirely upon the function of the part which is affected by the pressure. Tumours or abscesses in the brain, or in the neighbourhood of nerves, or blood-vessels, or on the valves of the heart, in the respiratory passages, the stomach and intestines, or on, or in, the vicinity of organs the functions of which are essential to life, necessarily cause serious and sometimes even fatal interference with vital processes. Besides the direct mechanical effects of blows or wounds or pressure, there may be immediate depression of the vital powers from the shock to the nervous system reacting on the heart, causing stoppage of the circulation, followed by fainting and sometimes by death.

Chemical causes may act upon the interior or exterior of the body, and they may be either extrinsic or intrinsic. The former will include all kinds of irritants or caustics which may be intentionally or accidentally applied to the surface of the body. The action of these, whether they are powerful acids or caustic alkalis, or other chemicals which have the power of destroying integrity of organic structures, has the advantage of being easily recognized, and if discovered in time, may be considerably checked

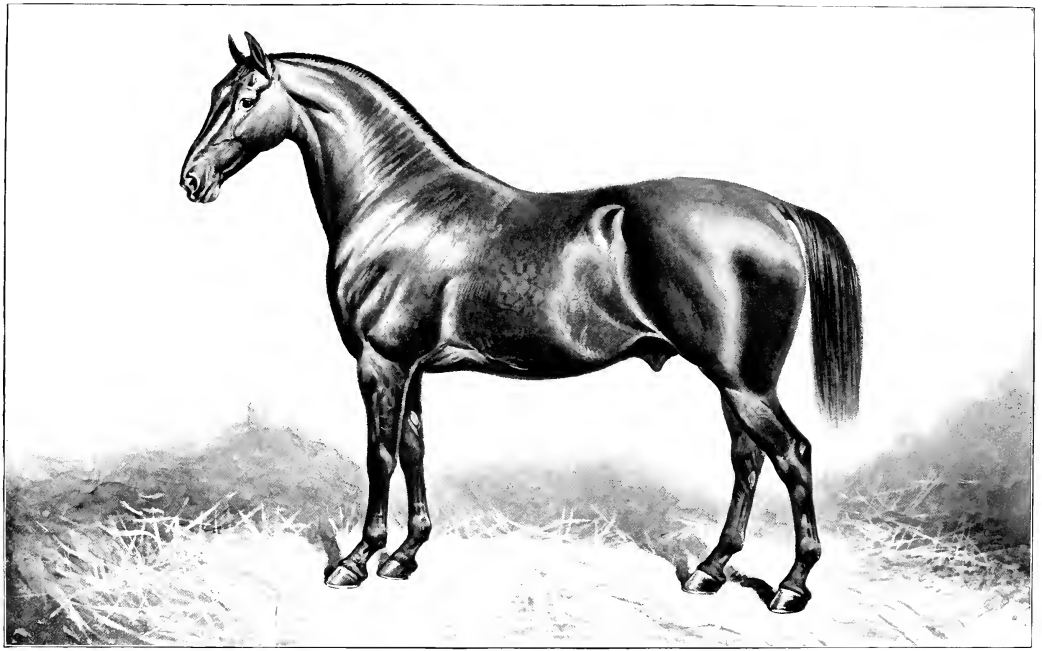
by the employment of appropriate remedies. The chemical agencies which act as intrinsic causes of disease will include those which have just been referred to, with the addition of all poisonous agents either belonging to the organic or the inorganic classes, and all the deleterious products resulting from deranged digestion or from imperfect oxidation. Of the effete products which are thus converted into animal alkaloids and extractives, the disastrous effects have already been adverted to under the heading of predisposing causes.

Food.—In respect of the influence of solid and liquid food, the lower animals are favourably situated in comparison with the human subject, as, in a state of domestication, horses and other animals which are used in the service of man are not permitted to exercise their own taste in the selection of their diet, but are supplied by their owners with the amount and quality of alimentary matters which are selected with the distinct intention to produce certain desired results. It may happen, however, that in carrying this intention into effect the food may act as an exciting cause of disease owing to an excess of certain constituents. Thus, in the case of animals which are kept for the purpose of being fattened, serious disturbance of certain organs, especially of the circulatory and respiratory systems, may be occasioned in consequence of the excessive quantity of fatty material which is deposited in the structure of important organs such as the liver and heart. Serious results may also follow the consumption of adulterated alimentary matters, which are, as a matter of fact, only given in ignorance, and may therefore be looked upon as accidental causes of disease, which could be avoided by the exercise of care on the part of the attendant. In the case of the horse, the food is generally of a very simple nature, consisting of hay, oats, beans or peas, bran, and, incidentally, green food and carrots. None of these articles of diet lend themselves to any process of adulteration; but some of them, oats and hay particularly, may become dangerous in consequence of changes which take place during fermentation, or from the growth of certain moulds, or from accidental contact with the virus of infective diseases. Mouldy hay, and oats which have been damaged by water and afterwards kiln-dried, commonly produce serious and sometimes fatal effects. The condition of these articles of food is easily recognized, and their use may consequently be readily avoided; but in the case of accidental contamination with the infective matter of anthrax or other contagious disorders there is little probability of the fact being discovered until the animal exhibits indications of the disease, and even then the contaminated food may altogether escape suspicion. Deficiency of food is a predisposing cause of disease, but when it amounts to extreme privation it becomes an exciting cause. The immediate consequences are lowering of

temperature, poverty of blood, irritation of the mucous membrane of the stomach, sometimes solution of the walls of the organs by the action of the gastric juice, fever and delirium—in short the ordinary indications of starvation. This condition is, of course, extremely rare in relation to horses, excepting as the result of accident or the presence of some disease in the mouth or swallow which prevents the animal from taking food.

Excessive exertion has already been considered among the predisposing causes, and in order to become an exciting cause it must be pushed to such an extent as to induce acute congestion of the vessels of the lungs or brain or some other organ, a condition which will be quickly followed by interference with the action of the heart and total stagnation of the circulation. Short of this condition, which will necessarily be fatal, congestion of the important organs referred to may be followed by inflammation, which, though not necessarily fatal in its effects, is not unlikely to leave serious structural changes in the parts which are affected. The other exciting causes of disease of a cognizable kind are nervous excitement, excessive or defective secretion, impure atmosphere, and climatic changes. The action of all these has been described under the head of predisposing causes of disease. It is easy to understand that they all of them become exciting causes when pushed to an extreme. Thus, violent **nervous excitement** may result in a fatal shock, or it may induce an attack of apoplexy. Excessive secretion may under certain circumstances cause fatal syncope; while deficient secretion not only impairs the function of the organ for which it was intended, but leads to the accumulation of poisonous matters in the system, which, if not immediately fatal, may lead to serious organic disease. **Defective ventilation**, uncleanliness, and drainage leading to the accumulation of large quantities of septic matter in the air may occasion rapidly fatal septic poisoning or various forms of disease, which may be commonly classed as low fevers presenting all the indications of typhoid. **Climatic changes** involving sudden transitions from cold to heat not only render the system liable to various disorders, but are also capable of immediately producing affections of the respiratory system from simple catarrh to bronchitis and pneumonia, in addition to internal congestion of other important organs. The immediate effect of extreme cold is rapidly to reduce the vital powers; the action of heat, on the other hand, tends to cause internal congestion of the liver and other organs, and even extreme congestion of the brain, which may be fatal.

Specific causes of disease relate to all those maladies which only occur under the influence of a particular virus or poison. It has been



HARNESS HORSE

PLATE XXI.

found convenient to classify these diseases under the terms endemic, epidemic, and contagious or infectious. Endemic diseases, or in regard to the lower animals enzootic, affect individuals in certain parts or districts only where the specific cause exists and remains. Certain malarial fevers, for instance, belong to particular parts of the world, and susceptible subjects living in those districts are liable to be attacked repeatedly, but they do not, on removal from the localities, carry the disease with them; the affections, therefore, of this class are clearly not contagious or infectious. Epidemic (epizootic) differ from enzootic maladies as they do not occur persistently in a particular locality, but prevail from time to time, affecting large areas, passing through periods of accession and decline, and reappearing at irregular intervals not necessarily in the places in which they previously prevailed. To this class the common disease among horses, influenza, belongs. Outbreaks of the disease occur in various parts of the country at different times, and during its prevalence large numbers of horses are attacked; after an uncertain period the malady gradually ceases, only to recur in the same form, or with certain variations, probably in the following season. The cause of these maladies is not known, no specific virus has been detected, and the views with regard to their contagious or infectious qualities are very conflicting.

Contagious and infectious causes.—The two terms contagious and infectious are by advanced pathologists looked upon as interchangeable, but, notwithstanding, they are commonly used with the meanings which were formerly attached to them at the time when the word contagion was accepted as meaning transmission of disease from an affected to a healthy subject by the actual and gross contact of the virulent matter, while infection was held to represent the less obvious mode of transmission through the medium of the atmosphere or by other even less apparent means. The combined signification may now be taken to indicate the propagation of certain maladies through the transmission in any way of the infecting matter of a specific to a healthy and susceptible subject. Contagion or infection may be immediate or mediate. In the first case it is necessary that there should be close association between the diseased and the healthy, so that the transmission of infection is direct; while in the other the infective matter must be conveyed by the agency of persons or substances which have been in contact with, or used about, the affected animal. Some of the contagious and infectious causes are still undefined, while others have been demonstrated to be material and recognizable; the cause, for example, of anthrax, glanders, and tuberculosis, foot and mouth disease, pleuro-pneumonia, cattle plague, sheep pox, swine fever is now known to be in each case due to a minute organism belonging to the large

class of fungi. In the horse there are only three or four diseases which have been shown to depend upon a disease-producing microscopic organism, which in each case is distinguished by certain peculiarities of form and modes of growth. The diseases are anthrax, glanders, and tuberculosis. Strangles is the consequence of the introduction into the system of a pus (matter) producing organism belonging to the streptococci. On the basis of the fact that some contagious maladies depend for their existence on a living organism, the pure cultivation of which outside the body will produce the disease when inoculated into a susceptible subject, it has been assumed that all contagious diseases depend on the presence of similar living beings. This, however, remains to be proved with regard to a considerable proportion of contagious maladies. Small-pox, scarlatina, rabies, for example, and vaccinia, have not up to the present time furnished characteristic microbes, although the search for them has been pursued for a long time past, and is still being carried on with the utmost diligence by experts in different parts of the world.

BACTERIA

Although disease-producing micro-organisms take their place naturally among the exciting causes of disease, their life-history has attracted so much attention during the last twenty years, and has been so exhaustively studied during the last ten years, that it is imperative that they should receive special consideration. The discovery of the microscope, which, according to Professor Edgar Crookshank, was an event of two and a half centuries ago, was as a matter of course followed by the detection of organisms in animal fluids and elsewhere, the existence of which previously could only be suspected. Shortly after the microscope was first brought into use, it was found that small living things were abundantly present in all decomposing substances, and Kircher believed that similar organisms could be found in various diseases. His researches were directed to the discovery of such organisms; but the modern microscopist would conclude without hesitation that Kircher's chances of success were extremely remote with the very primitive form of optical appliances which were then at his command. The knowledge of the forms and functions of bacteria advanced along with the progress in the development of the microscope, and a considerable step was taken when Anthony Van Leeuwenhoek devoted his attention to the construction of lenses, and made such improvements in the microscope as earned for him the title of the father of microscopy. In 1675 he described, in a series of letters to the Royal Society, numerous minute organisms in rain water, well water, infusions of pepper and hay,

and also in many vegetable and animal substances. In 1683 the discoveries were illustrated by means of wood-cuts, and Professor Crookshank, from whose historical account in his work on Bacteriology these facts are quoted, remarks that there can be little doubt that the drawings were intended to represent leptothrix filaments, vibrios, and spirilla. In another communication in 1692 Kircher gives some idea of the size of these small organisms by stating that they were a thousand times smaller than a grain of sand. Further observations were made by Nicolas Andrè in 1701, Lancisi in 1710, and in 1721 the plague in Toulon and Marseilles was attributed to the presence of animalcules, and the theory began to be entertained, amidst considerable ridicule, that all diseases arose from vermicules. Scientific knowledge of the subject was considerably advanced by the writings of Müller, who criticised the previous researches, which, he contended, had been too much directed to the finding of new organisms. Müller devoted himself to a consideration of the forms, movements, and other biological characters of the microbes, and attempted a system of classification. At this time the question of the origin of micro-organisms became paramount, and the theory of spontaneous generation with its alternative, development from pre-existing germs, was widely discussed. Many supporters were found for the theory of spontaneous generation, but the balance of the evidence, obtained by numerous experiments, was in favour of the germ theory. Even as late as 1872 Bastian published an account of his experiments with the object of proving that spontaneous generation actually took place. He found that decoctions of turnip and cheese, which had been filtered and boiled for ten minutes and hermetically sealed during the boiling, contained micro-organisms after a time. This evidence was very soon met by the further discovery that in milk, infusions of hay, and other substances the spores of bacilli are present, and that they are not destroyed by boiling. Tyndall further demonstrated that if the method on which Bastian relied was repeated two or three times, all the spores of organisms were destroyed; and thus the last attempt to demonstrate the truth of the theory of spontaneous generation utterly and entirely failed. During the controversy on the subject of spontaneous generation, several investigators, Latour, Schwann, Bassi, Henley, Davaine, Pasteur, and others, were working steadily in reference to the functions of bacteria, the various processes of fermentation, and production of disease. In 1850 Davaine and Rayer discovered a rod-like body in the blood of a sheep that had died of splenic fever (anthrax); Pollender also discovered similar bodies in the same disease, in the blood of cattle. There is no doubt that this rod-like body was the organism which is now familiarly known as the bacillus anthracis. It was not, however, until further investigations had been carried on by Davaine,

Pasteur, Burdon Sanderson, Duguid, and others, that the rod-like body, bacillus anthracis, was accepted as the true cause of anthrax; and the demonstration of this important fact may be looked upon as the foundation of the doctrine of contagium vivum, as the origin of contagious disease.

Morphology of bacteria. — Bacteria have been defined as minute vegetable cells. Their claim to a vegetable origin is based upon the experimental fact that they have the power of obtaining their nitrogen from ammonia, a property which is not possessed by animals. In form these organisms vary considerably: the most primitive is to be found in the extremely minute round or oval cells which are described as cocci (fig. 74),

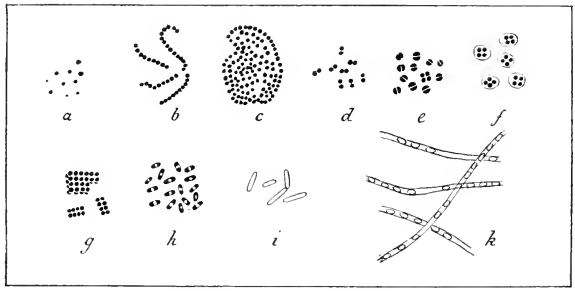


Fig. 74. Bacteria and Bacilli. Highly magnified

a, Cocci, singly and varying in size. *b*, Cocci in chains (*streptococcus*) *c*, Cocci in masses (*staphylococcus*). *d* and *e*, Cocci in pairs (*diplococcus*). *f*, Cocci in groups of four (*merismopedia*). *g*, Cocci in packets (*sarcina*). *h*, Bacterium (*Septicæmia hæmorrhagica*). *i*, Bacillus (*B. subtilis*). *k*, Spore formation illustrated by *Bacillus anthracis*.

the variation in size being indicated by the prefix mega for the larger and micro for the smaller cocci, hence the terms *megacocci* and *microcoeci*. When two circular or oval cells are joined together they are described as *diplococci*. When a number of cells are united to form a chain, the organism is termed *streptococcus*. When there is a combination of four cocci the term tetrad, or *merismopedia*, is applied. When the packet consists of eight divisions a *sarcinacoccus* is formed. When irregular heaps like bunches of grapes are found, the mass is called *staphylococcus*, and if irregular masses of cocci are found imbedded in a gelatinous matrix it is called *ascococcus*. Some micro-organisms present a rod-like character, varying considerably in length; the very short rods with rounded ends are described as *bacteria*, the longer ones as *bacilli*, which term is always

used when the length of the rod is more than twice its diameter. There are also other forms, distinguished by the terms *vibrios* and *spirilla* (fig. 75), and other filamentous forms.

Action of bacteria in the production of disease.—When it was first suggested that diseases were due to the action of minute organisms, the question as to the mode of their action naturally arose, and various theories were promulgated. Some authorities were disposed to refer the deleterious influence of the microbes to the mechanical blocking-up of the vessels by accumulation of large numbers. This view, however, was obviously insufficient to account for the phenomena which were observed. A more reasonable view refers their baneful effects to a fermentative process which it would appear to be their particular function to originate. Some experiments which were made with reference to septic infection by Dr. Hiller went far to prove that the bacteria themselves were perfectly harmless, but were capable of inducing chemical changes in the fluids and solids of the body which led to the formation of animal poisons. Dr. Burdon Sanderson, in commenting on this function of bacteria, and particularly on Dr. Hiller's experiments, remarks that having collected a considerable mass of bacterial material, that is, of bacteria obtained from various fluids in advanced putrefaction, on a filter, Dr. Hiller washed the mass, just as one washes a precipitate, a great number of times; then diffused the material which had been so washed in distilled water, and injected it in repeated doses into the circulating blood of animals. The injections were entirely without effect. Hiller next proceeded to inoculate himself with the same material, and again without effect. The advocates of bacteria at once objected to Hiller's experiment that the bacteria, not being accustomed to distilled water, were so injured by the repeated washings that they had lost their activity. The criticism, however, might just as well have been spared, for it afforded Hiller the opportunity of proving by experiment, which was, of course, easy enough, that the washed bacteria were as lively and as capable of development as ever. It would appear from these observations as to the function of bacteria in the production of septic infection that they are really manufacturers of poison, and that when freed themselves from the material in which they live they are perfectly innocent. This view, which was promulgated ten years ago, is the one which is in favour with advanced pathologists, and it is a remarkable development of Dr. Hiller's researches that bacteria

Fig. 75

B, Spirillum undula.
1 Chromatic granules.
2 Sap vacuoles.
3 Protoplasm.
C, Spirillum rubrum with polar cilia.

are now constantly employed for the purpose of producing toxic fluids, which are used for purposes of diagnosis and even of curing disease, as illustrated by the present use of tuberculin for the detection of tuberculosis, mallen for the discovery of glanders in horses, a preparation of the bacillus of diphtheria, modified by passing through the system of the horse, for the cure of diphtheria in man, and the use of the modified cultivation of the bacillus of tetanus for the cure and prevention of that disease both in the higher and lower animals.

The action of microbes in the production of contagious diseases was demonstrated most perfectly by Pasteur in his researches on chicken cholera and splenic fever (anthrax). In the course of these experiments he proved not only that pure cultivations of the microbe outside the body would produce the disease with absolute certainty in healthy fowls, but also the still more important fact that by modifications in the method of growing the organism the activity of the poison would become diminished until it finally ceased. This discovery has been taken advantage of largely by bacteriologists, with the result of ascertaining that an attenuated or weaker virus may be obtained not only by modifying the method of cultivation in certain media, but by passing the virus through the system of an animal belonging to a different class from the one originally attacked. Thus the bacillus of anthrax, after being passed through the guinea-pig, loses its fatal activity on cattle (Sanderson and Duguid); the bacillus anthracis of whatever source, after having been passed through the white mouse, loses its fatal activity on sheep (Klein and Roy); and the same organism, when passed through the South American rodent biscachia, loses its fatal activity on cattle (Roy). That this weakening or loss of virulence does not depend upon the death of the bacilli is proved by the fact that if they are again cultivated in the ordinary way in nutritive media they recover all their former quality—power to injure and to kill.

It has been asserted that there are at least three micro-organisms which are without any pathogenic property, and which may, when grown under certain conditions, acquire such properties. Thus the common hay bacillus (bacillus subtilis), according to Buchner, may by cultivation be transformed into bacillus anthracis; a common bacillus which is present in the atmosphere may assume distinct pathogenic properties if grown in an infusion of the seeds of abrus precatorius, and the common mould aspergillus, when grown on alkaline material, assumes poisonous properties according to Grawitz. That these statements are absolutely without foundation may be positively asserted on the evidence of numerous experiments; and it may be affirmed, on the contrary, that in no case

does an innocent or benign organism acquire the power to excite a specific form of disease under any method of cultivation which has yet been devised.

The specific organisms which are found in contagious disease to which the horse is subject, are referred to and illustrated in the description of those affections.

DIGESTION

THE ALIMENTARY CANAL AND ITS APPENDAGES

The alimentary canal is a tube which, commencing at the mouth, is continued by means of the pharynx and œsophagus to the stomach, where it undergoes considerable enlargement. It then contracts again to form the small intestine, which is a long and coiled cylinder. This is succeeded by the large intestine, which terminates in the rectum with its outlet, the anus. The total length of the alimentary canal in the horse is about ten times the length of the body, and hence may be estimated at 100 feet, which may be thus apportioned:

Mouth and pharynx			1 foot.
Œsophagus			3 feet.
Stomach			2 „
Small intestine			72 „
Large intestine	Cæcum	3	
	Colon, large	12	
	Colon, small	10	
	Rectum	1	
			26 „
			104 „

The appendages of the alimentary canal are the lips, teeth, and salivary glands in connection with the mouth, and the liver and pancreas in connection with the small intestine. Each of these parts is deserving of a short description.

The lips are fleshy, movable organs, possessing a high degree of sensibility, and adapted for the prehension of food and for its retention within the cavity of the mouth during mastication. Externally they have a covering of hairy skin, some of the hairs being very large and long, and probably possessing an acute sense of touch; internally the lips are lined by mucous membrane, and present the openings of the ducts of many small salivary glands.

The teeth, more fully described elsewhere, are hard, bony organs, of immense importance in cutting, bruising, and breaking down the food.

In the male there are 40, namely 12 incisors, 4 canines, and 24 molars, which are thus arranged in the upper and lower jaw:—

I.	C.	M.
3 3	1 1	6 6
3 3	1 1	6 6

The mare is not provided with canine teeth or tusks. The teeth are composed of three substances of different degrees of hardness, the softest being named *cement*, the next harder *dentine*, and the hardest of all *enamel*. These wearing away with different degrees of rapidity, leave on the grinding surface ridges and sharp edges admirably adapted for the purpose they have to fulfil, of reducing the food, with the aid of the saliva, to a pulp.

Salivary glands (figs. 76, 77).—There are three chief pairs of salivary glands, which have received the names of *parotid*, *submaxillary*, and

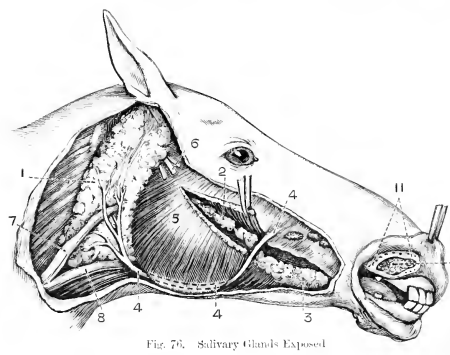


Fig. 76. Salivary Glands Exposed

[1] Parotid gland. [2] Molar glands. [3] Sublingual gland. [4] Parotid Duct. [5] Masseter muscle [6] Facial nerve. [7] Jugular vein. [8] Submaxillary vein. [10] Labial glands. [11] Labial ducts

sublingual, together with several subordinate glands known as the *molar*, or *buccal*, *labial*, *lingual*, and *staphyline*. They have a united weight of about 8000 grains avoirdupois, or about 1½ lbs. The parotid gland is by far the largest of the three principal pairs, weighing as much as four times the two others put together. The sublinguals are the smallest. The position of the several glands is shown in the adjoining wood-cuts.

In external appearance the salivary glands are of yellowish-white colour, and are easily broken up into small granules named lobules. In their structure they present a remote resemblance to a bunch of grapes (fig. 78), and have hence been termed racemose glands, the stalks of the

grapes (fig. 79) being represented by the ducts, and the grapes themselves by the follicles or secreting parts. Many such ducts meeting together

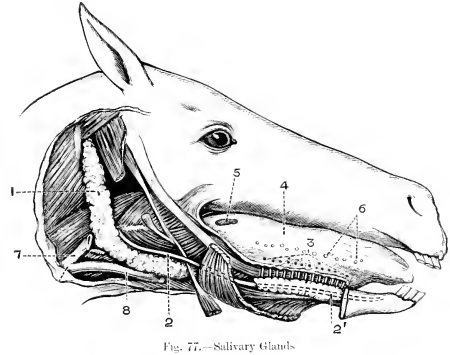


Fig. 77.—Salivary Glands.

[1] Submaxillary gland. [2 2'] Submaxillary duct (Wharton's duct). [3] Cluster of openings of ducts of sublingual glands. [4] Tongue. [5] Circumvallate papilla. [6] Fungiform papillæ. [7] Jugular vein. [8] Submaxillary vein.

form the principal salivary duct, which is single in the case of the parotid gland, opening on the inner side of the cheek, whilst in the case of the submaxillary gland it opens on either side of the tongue on

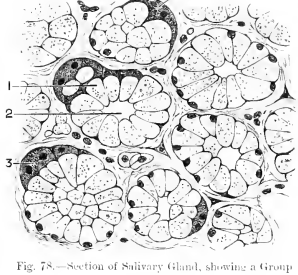


Fig. 78.—Section of Salivary Gland, showing a Group of Lobules.

[1] Secreting cells lining a lobule. [2] Central space into which the secretion is poured. [3] Dark cells forming the demilunes of Giannuzzi.

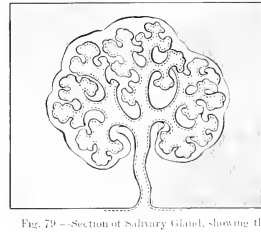


Fig. 79.—Section of Salivary Gland, showing the Connection of the Lobules with the Ducts and their Resemblance to a Bunch of Grapes.

the floor of the mouth. The ducts of the sublingual gland are numerous, and discharge their contents into the mouth beneath the tongue.

A section of several of the follicles or grape-like bodies is here shown (fig. 78), and it is seen that they are lined with cells which discharge the saliva they secrete into a central passage, whence it passes on into the duct. This small duct and others unite to form larger ducts that discharge their contents into the mouth. The saliva produced by the several glands differs considerably in its character and properties, in some, as in the submaxillary, being thick and slimy, whence that gland is named a *mucous* gland, whilst in others, as in the parotid, it is thin and watery, and this gland is therefore termed a *serous* gland. Occasionally, as in the submaxillary gland of man, both kinds of saliva flow from one gland. In all instances the saliva is poured forth in abundance as soon as food is introduced into the mouth; and as it is a typical example of the mode in which secretion is effected under nervous influence, and that on which our present knowledge of that process mainly rests, it may be advantageous to describe in some detail, but with as much simplicity as possible, the events that take place.

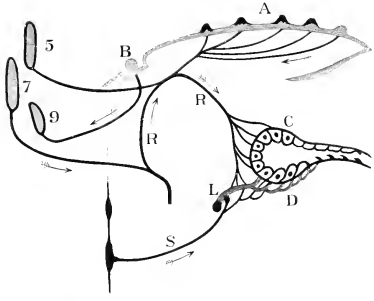


Fig. 80.—The Nervous Mechanism of Salivary Secretion

Let us suppose A (fig. 80) represents the surface of the tongue, with the fungiform, and B circumvallate papillæ of taste upon it; C a gland opening upon the surface, L an artery ending in capillaries D surrounding the gland. There are three nerve centres implicated in the secretion of saliva, each composed of many cells, here represented by one cell only. Of these three B 9 is the glossopharyngeal, or taste centre; A 5 is the lingual branch of the fifth pair of nerves; 7 is the facial centre, which gives branches to the gland cells and to the artery; lastly, S is the sympathetic nerve, springing from a centre, and supplying the gland cells and artery. When the mouth is empty, and no secretion is taking place, the sympathetic nerve keeps the blood-vessels in a contracted state, and the gland is quiescent. But if sugar, salt, or other sapid substance be placed on the tongue, the nerves in the papillæ conduct the impressions they receive in the direction of the arrows to the taste centres 5 and 9. Thence a nervous impulse is transmitted to the motor centre 7, as well as by other fibres to the brain.

From RR, which is a branch of the facial nerve named the chorda tympani, it will be observed, two sets of fibres emanate, one going directly to the cells of the gland, the other to the artery. Those to the artery cause it to dilate and so allow a freer current of blood to circulate in and around the gland; the other stimulates the gland cells themselves to secrete, and thus leads to an abundant flow of saliva. These nervous impulses ceasing with the swallowing of the food, the sympathetic centre resumes its supremacy and contracts the blood-vessels; then secretion ceases, to be resumed once more when sapid substances are again introduced into the mouth.

The thorough mingling of the saliva with the food is termed *insalivation*, and the process is of great importance and is very perfectly accomplished in all herbivora. The horse chews its food leisurely, and a large quantity of saliva is poured forth. Observations and experiments have been made which show that this animal takes from an hour to an hour and a half to eat 6 lbs. of hay, and more than half an hour to eat the same weight of oats. It makes about two hundred boluses, or separate masses for swallowing, of the hay; and from forty to ninety boluses of the oats. The weight of the dry hay is increased during mastication from 6 lbs. to no less than 25 lbs., and of the oats from

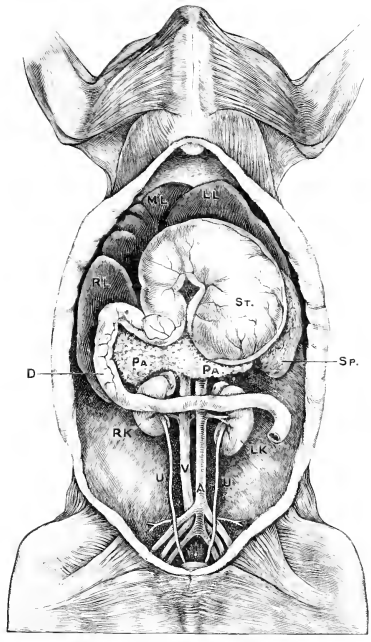


Fig. 81.—Abdomen Laid Open

A, Posterior or abdominal aorta. V, Posterior vena cava. U, U, Ureters. RK, Right kidney. LK, Left kidney. D, Duodenum. PA, Pancreas. SP, Spleen. ST, Stomach. LL, Left lobe of liver. ML, Middle lobe. RL, Right lobe.

6 lbs. to 14 lbs., the increase being entirely due to the saliva with which they have become impregnated. The mixed saliva, or saliva resulting from the mixture of the fluid secreted by the several glands, is an opalescent liquid with a specific gravity of about 1005; it is alkaline to test-paper, and contains a special ferment named *ptyalin*, the properties of which will be discussed when the process of digestion of food is under consideration.

Deglutition.—After the food has been masticated it is rolled by the tongue into a kind of ball and pressed backward against the palate till it is seized by the muscular walls of the pharynx and transmitted to the œsophagus or gullet, by which it is conducted to the stomach. In this course there is a critical moment when the bolus is passing over the opening of the trachea or windpipe, and the most carefully-regulated action of many muscles is required to prevent its entry into the larynx or trachea on the one hand and into the nose on the other.

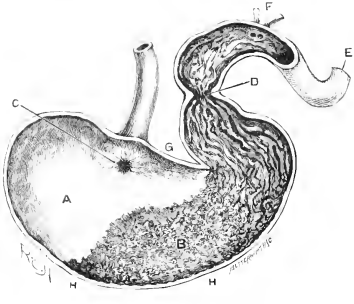


Fig. 82.—Stomach Laid Open

A, Left half. B, Right half. C, Cardiac orifice or entrance. D, Pyloric orifice or exit. E, Duodenum. F, Bile duct and pancreatic duct opening into the duodenum. G, Lesser curvature. H, Greater curvature.

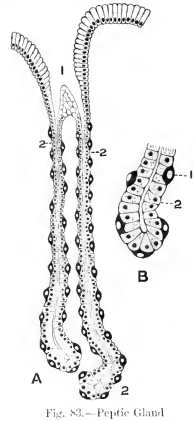
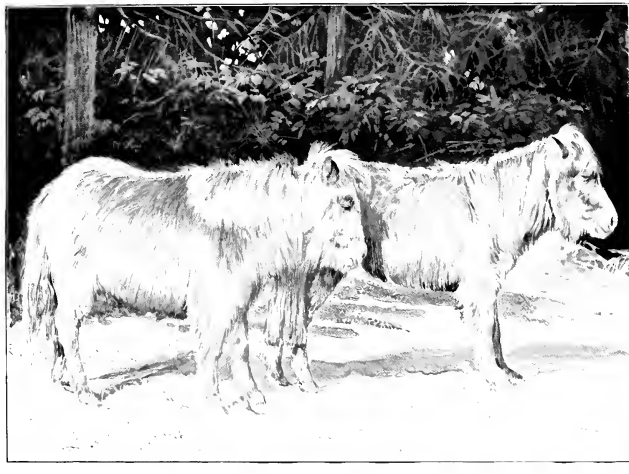


Fig. 83.—Peptic Gland

A, [1] Opening through which gastric juice is discharged into the stomach; [2] divisions of the main duct.

B, [1] Parietal cell; [2] central cells.

The stomach is a well-defined segment of the alimentary canal which intervenes between the œsophagus or gullet and the small intestine. Seen from behind it presents the relations shown in the adjoining wood-cut (fig. 81), having the liver in front, the spleen to the left, and the pancreas above. Its average capacity is 14 quarts, and it weighs about 3½ lbs. The food enters by an opening on the left of the middle line termed the cardiac orifice, and leaves by another on the right side called the pylorus or pyloric



Mrs. Hope's Shetlands as they appeared in their Highland home

The same ponies in the hands of Mrs. Hope

orifice. It possesses three coats, of which the *external* is a thin layer of peritoneum, the free surface of which is extremely smooth and polished, and is kept constantly moist to permit of movement against the adjoining viscera with the least possible friction; folds of this layer, named omenta, keep the stomach in position and attach it to the liver and spleen. The *middle* coat or layer is *muscular*, the outermost fibres of which run longitudinally and the innermost circularly; between the two is a net-work of nerve fibres. The muscular coat enables the stomach to contract, and by so doing to accommodate itself to the quantity of its contents, and it also propels the food into the intestine. This it accomplishes by an undulating or worm-like motion called *peristalsis*. The peculiar valve-like arrangement of the muscular tissue near the œsophageal opening at which the food enters, as well as the position of this aperture, explain the difficulty that horses experience in vomiting. The third and *internal* coat is the *mucous* coat, which presents a striking difference in its appearance in its right and left portions. That of the left half (A, fig. 82) presents a white aspect, and is covered with flattened epithelial cells, which form a thick membrane lining the stomach, beneath which are the numerous small prominences or papillæ of the subjacent mucous tissue. The right half, on the contrary, which commences abruptly by a sinuous line where the left terminates, is soft, of pink colour, and vascular, and presents the openings of many thousands of glands, named peptic glands, which secrete the gastric juice. An example (fig. 83) of such a gland is here shown. The duct, it will be observed, is wide at the upper end, where it opens into the general cavity of the stomach, but soon divides into two or more, which terminate below in blind extremities.

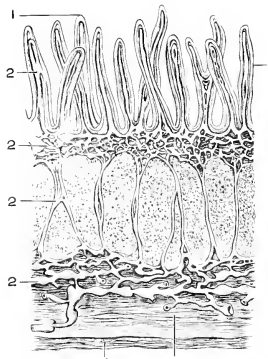


Fig. 84.—Section through the Small Intestine

[1] Villi. [2] Lacteal vessels. [3] Muscular coat. [4] Serous coat.

The gastric juice is a clear fluid of acid reaction, which is secreted in large quantity when food is taken into the stomach. It contains very little solid matter, the proportion of water being nearly 99·5 per cent, but there are in it two constituents which exert a powerful influence on the process of digestion—one a ferment named pepsine and the other hydrochloric acid.

The small intestine.—The small intestine commences at the

pylorus, which is the strong muscular ring that separates the stomach from the intestine, and it terminates at the point where the alimentary canal suddenly enlarges to form the large intestine. Its length is more than 70 feet, and its width, when undistended with food or gases, about $1\frac{1}{2}$ inch. It is suspended from the vertebral column by a double fold of membrane (peritoneum), which is here named the mesentery. The

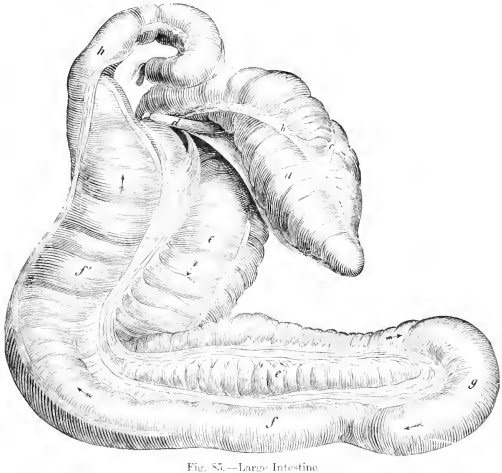


Fig. 85.—Large Intestine

a, Cæcum; *b*, *c*, muscular bands; *d*, ileum, or terminal portion of small intestine; *e*, *e'*, *f*, *f'*, large colon; *g*, pelvic flexure; *h*, single colon

blood-vessels, lacteals, and nerves of the intestine reach it by running between these two layers of the mesentery. In structure the small intestine resembles the stomach in having an outer serous covering of peritoneum, a middle layer of longitudinal and circular muscular fibres, and an internal mucous layer. When closely examined the mucous membrane of the small intestine exhibits a velvety or pile-like arrangement, which is most conspicuous when the membrane is floating in water. This appearance is due to the presence of an immense number of small projections about $\frac{1}{50}$ of an inch long, named villi (1, fig. 84), between which are the openings of minute glands (Lieberkühnian follicles), named after Lieberkühn, a Dutch anatomist, who first described them about 1745.

The villi number many millions, and are interesting as containing the lacteals, a set of vessels by which the food is absorbed and conveyed into the system. It is sufficient in this place to say that they present a central tube, which commences with a free extremity above, and ends in a network at the base of the villus in the wall of the intestine. These lacteal vessels are each invested by a mantle of smooth muscular tissue, and this again by a plexus of capillary blood-vessels. The whole is enclosed by a transparent membrane covered with cells that project into the cavity of the intestine. The Lieberkühnian follicles are simple tubes very closely set and lined by columnar epithelium. The secretion they pour into the intestine has high digestive powers for all kinds of aliment.

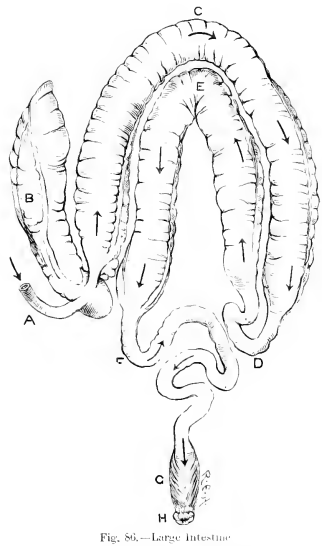


Fig. 86.—Large Intestine.

A, Ileum, or terminal portion of small intestine. B, Cæcum. C, E, Large colon. D, Pelvic flexure. F, Single colon. G, Rectum. H, Anus. The arrows indicate the course taken by the food in the process of digestion.

The large intestine consists of three parts, the cæcum, the colon, and the rectum. The small intestine opens into the first part of the large intestine by an orifice that is guarded by a fold of mucous membrane named the ileo-cæcal valve, which prevents the return into the small intestine of the food which has entered the cæcum. True villi stop abruptly at this spot, and are not found in the large bowel.

The cæcum is a greatly enlarged portion of the intestine. It occupies the right side of the abdomen, and has a capacity of 7 or 8 gallons. The surface is marked by four longitudinal bands of muscle, which being shorter than the other coats, pucker them into great bulging pouches. The upper extremity is curved and presents two openings, one by which the small intestine terminates in it; and the other very narrow, which communicates with the colon, or second division of the large intestine.

The colon is divisible into two parts—the large or double colon, and the small or floating colon. The length of the large colon is about 12 feet, and its capacity about 18 gallons. The length of the small colon is about 10 feet. The cæcum and both the large and small colon have the same general arrangement of the coats as the other parts of the intestine.

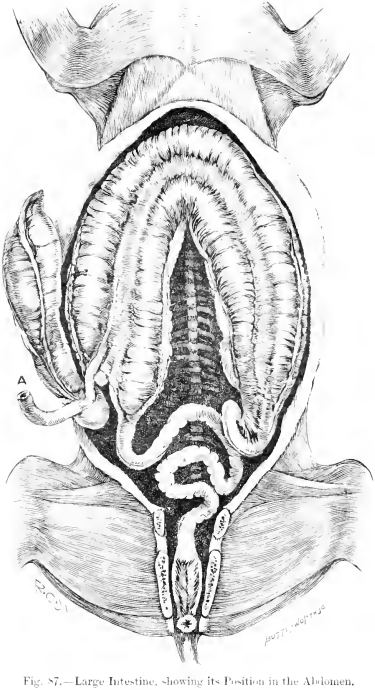


Fig. 87.—Large Intestine, showing its Position in the Abdomen. For description see Fig. 86.

The rectum is a short, straight tube extending from the last and shortest division of the colon. It takes a straight course backward, and terminates in the anus or external orifice. The muscular layer of this segment of the intestine is very strongly developed. The orifice is surrounded by circular fibres, which form a tolerably well-defined ring to which the name of *sphincter ani* has been given. This ring keeps the aperture closed. There is also another muscle connected with it, which pulls the posterior part of the bowel forward after defæcation, and is known as the *retractor ani*.

The liver.—This organ is the largest gland in the body, weighing from 10 to 12 lbs. avoirdupois. It occupies the fore part and right side of the abdominal cavity, being situated immediately behind the diaphragm. It is kept in position by strong folds of the peritoneum, which extend from it to the diaphragm and adjoining organs. Its colour is reddish-brown. It is divisible into three principal lobes, of which the left is the largest

and the central one the smallest. There is, in addition, a small lobule, named the lobulus Spigelii, connected with the posterior face of the right lobe.

The structure of the liver is highly complex, but it consists essentially of a mass of cells separated by connective tissue into small lobules, which are further defined and isolated by the blood-vessels and bile-ducts which surround them.

The cells.—These are rounded masses of protoplasm without cell membrane, but containing a nucleus and granules of various kinds, some

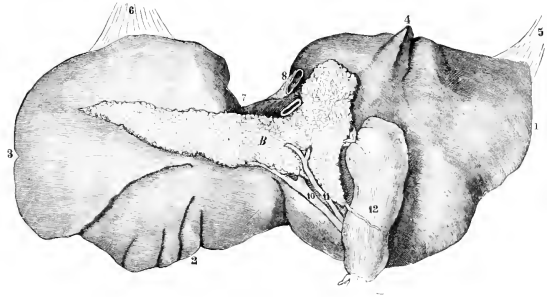


Fig. 88.—The Liver and Pancreas

[1] Right lobe. [2] Middle lobe. [3] Left lobe. [4] Lobulus Spigelii. [5] Right lateral ligament. [6] Left lateral ligament. [7] Œsophagus. [8] Posterior vena cava. [10] Ductus choledochus or bile-duct. [11] Pancreatic duct. [12] Duodenum, or first portion of small intestine. B, Pancreas.

being particles of pigment, others oil globules, and others again grains of glycogen. They are separated from one another by minute blood-vessels, by the capillary bile-ducts, and by lymph spaces. Their functions are to secrete bile, to store up glycogen, and to give that substance up again to the blood when required for the purposes of the economy.

The blood-vessels.—Three blood-vessels are concerned in the circulation of the liver. Two carry blood to it—the hepatic artery and the portal vein—while the third, the hepatic vein, returns the blood which has circulated through the gland to the posterior vena cava, which it joins just before that vessel perforates the diaphragm to discharge its blood into the right auricle of the heart. The hepatic artery divides and subdivides to form capillaries which join those of the portal vein in the lobules. The portal vein is a large trunk that contains the blood returning from the stomach and intestines, and from the spleen and pancreas. Having reached the inferior surface of the liver it penetrates into its substance,

and, as an exception to the usual behaviour of veins, instead of joining a larger vein, which in this case would be the vena cava, it proceeds to break up as if it were an artery, into smaller and still smaller branches, which run between the lobules and are hence called interlobular veins (3, 3, fig. 90). From these, minute branches are given off which enter the lobules and there form a net-work of capillary vessels ramifying among the cells (2, 2, fig. 90), and then, after uniting and reuniting, form a blood-vessel which runs down the centre of the lobule and is known as the intralobular vein (1, fig. 90). From this the blood passes out of the lobules into a set of veins beneath it (sublobular veins), and then enters the hepatic vein. The blood as it

Fig. 89.—Hepatic Cells

[1] Hepatic cell. [2] Nucleus. [3] Granules of fat, pigment, and glycogen. [4] Bile capillaries.

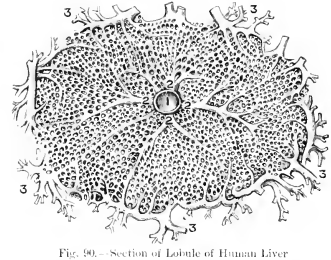


Fig. 90.—Section of Lobule of Human Liver

[1] Section of intralobular or central vein. [2] Its smaller tributaries, which receive the blood from 3 and convey it to 1. [3] Interlobular or peripheric branches of the vena porta.

traverses this close net-work of capillaries within the lobules comes into intimate relations with the gland cells which occupy the spaces between them.

The bile-ducts commence in the form of an extremely delicate net-work of tubes which ramify over and between the gland cells in the lobule, and take up from them the bile they have secreted. After uniting to form larger and larger tubes they at length terminate in the common bile-duct. This opens into the first part of the intestine just beyond the stomach in common with the duct of the pancreas. No gall-bladder is present in the horse.

The bile is a glairy fluid of yellow, green, or olive-brown colour, alkaline reaction, nauseous smell, and bitter taste. It has a specific gravity of about 1·030. It has been estimated that a horse secretes about $\frac{1}{66}$ part of its weight of bile in twenty-four hours, or about 12 or 14 lbs. The flow of bile into the intestine increases about an hour after food has been ingested, and the quantity continues to be large for some hours, when it gradually declines till after the next meal.

Glycogen.—This substance, although especially abundant in the liver, is rather widely distributed in the body, being a constituent of the white cells of the blood, the muscles, and various embryonic or growing and developing tissues. It is a white, tasteless substance resembling ordinary starch, except that on the addition of iodine it assumes a port-wine red instead of a blue colour. It appears that the liver can produce glycogen either from the saccharine or from the nitrogenous group of alimentary substances, but it is not increased when fats are given in excess. The livers of rabbits fed on carrots, and of dogs fed on lean meat, both contain abundance of glycogen. It is a store of easily oxidizable material, which, after being converted into sugar, can be absorbed by the blood at the liver, and being carried to the muscles is there burnt off, giving rise to the liberation of muscular force and to animal heat. It disappears both in muscles and in the liver after prolonged and violent exertion.

The pancreas.—This gland, commonly but incorrectly spoken of as the "sweetbread", is deeply seated in the abdomen, lying above the stomach, between it and the spine, and occupies the space enclosed by the loop of the duodenum or first division of the small intestine. It is of pinkish-gray colour, and weighs about 1½ lb. It is a highly important gland, its secretion exercising a powerful digestive action on starches, oils, and proteids.

Food.—The natural food of the wild horse is the fresh moist succulent grasses and cereals of the temperate zones. These include many species of the Graminaceæ, and plants like the mallow, rumex, and ranunculus from other orders. In the domesticated animals, however, whilst grass forms part of the food for part of the year, many working horses in large towns live on the dried stems, flowers, and fruit of the grasses, with some addition from the seeds of the leguminous plants.

The food of an average-sized horse performing a moderate amount of work may be taken in England at 12 lbs. of hay, 10 lbs. of oats, 2 lbs. of crushed maize, and 8 lbs. of chaff, with five or six gallons of water, according to the requirements of the animal.[1] In considering the changes wrought in the food during the process of digestion, it is to be borne in mind that the main constituents of the various plants eaten by the horse, whether in the open field or in the form of hay, corn, and beans, are reducible to a few groups which are named proteids, farinaceous and saccharine compounds, oils, vegetable acids, water, and salts.

The proteids constitute the most important of the food constituents because they contain nitrogen, sulphur, and phosphorus. They are repre-

[1] In France, in 1885, the omnibus companies supplied each horse with 10 lbs. of oats, 8 lbs. of bruised maize, and about 2 lbs. of feverole, a sort of small bean, the product of *Vicia faba*.

sented by the gluten of wheat, the legumin of beans and peas, and the aleuron grains of many seeds. Chemical analysis shows that they contain, in every 100 parts, 52 of carbon, 7 of hydrogen, 16 of nitrogen, and 24 of oxygen, with about 1 per cent of sulphur. In the animal they exist in two conditions—in the fluid and soluble, as in white of egg, the fibrin and albumen of blood, and the casein of milk; and in the solid and insoluble form, as in the substance of muscle, connective tissue, and the protoplasm of various cells.

The starches, sugars, and gum have been classed together under the general term of the carbohydrates, since one of their constituents, carbon, is combined with oxygen and hydrogen united in the proportion to form water. The compositions of several varieties is represented by the formula C^{12}, H^{20}, O^{10}, of others by C^{12}, H^{24}, O^{12}. The starches are very widely distributed in plants, appearing as the first evident products of assimilation, and being formed by the decomposition of the carbon-dioxide contained in the air and water they absorb. They are sometimes found in solution, as in the case of various sugars, but more commonly in the form of grains occupying the spaces in the interior of cells, and constituting a reserve of nutriment which is drawn upon in the course of the growth and development of the plant, but which is also a valuable aliment capable of being assimilated by animals. Starch is abundant in many fruits, as in the banana and fig; in seeds, as in those of all the cereals; in rhizomes, as in the arrow-root; in tubers, as in the potato; and in stems, as in that of the sago palm. The process of the ripening of fruit consists in large measure in the change of starch into pectin, dextrin, and sugar, under the influence of light and heat. The particular form of sugar, as cane, grape, beet, maple, eucalyptus, or mushroom, depends on the special activities of the plant, and the several forms differ *inter se* in their solubility, crystalline form, chemical composition, action on polarized light, and other characters.

The oils found in plants are divisible into two groups, the fixed and the volatile. The fixed oils are compounds formed of glycerine united with the fatty acids; thus, palmitin is composed of glycerine and palmitic acid, stearin of stearic acid and glycerine, olein of oleic acid and glycerine. The process of emulsification is simply that of reducing them to fine globules by shaking them up with any glairy fluid. Such emulsions may last unchanged for a considerable period, but as a rule the mist of oil runs together into droplets and these again into drops, which collect together, and the original condition of a layer of oil is recovered. There is no chemical alteration in emulsification. The process of saponification is, on the contrary, attended with a profound change in the chemical composition of the oil or fat. It is effected when the oily substance is intimately

mixed with an alkaline solution, as of soda or potash. The alkali displaces glycerine and combines with the acid. Soaps, therefore, are oleates, palmitates, margarates, or stearates of soda, or potash, or lime. These salts, as they may be called, are capable of traversing animal membranes, which is not readily accomplished by the oils in their natural state.

The volatile oils are very numerous, and give to different plants their peculiar and characteristic odours. Thus the smell of new-mown hay is due to the volatile oil (cumarin) which is contained in the *Anthoxanthum odoratum*, the odour of mint to the oil of mint, and so on; the quantity being usually small, in mint, for example, not exceeding 1 or 2 per cent of the dried plant.

In regard to the *salts*, they may be divided into two groups—those formed by the so-called mineral acids, such as the sulphuric, nitric, phosphoric, hydrochloric, and silicic acids, in combination with the bases, sodium, potassium, magnesium, lime, and others; and those formed by the organic acids, which are combined with the same bases, and of which the chief are oxalic acid, found in such plants as the oxalis, dock, rhubarb, and spinach, malic acid in apples, tartaric acid in the grape, formic acid in the nettle, acetic acid in chamomile, propionic acid in milfoil, butyric acid in the pansy, and many others.

If we now consider the composition of the ordinary food of the horse in the light of these preliminary remarks, we shall find that whilst such substances as oats and maize can be analysed with great exactness, it is almost impossible to give even an approximate account of the composition of hay, since it varies with the soil, the species forming the herbage, and even with the period of growth of the plants of which it is composed: the saccharine principles being most abundant at the period of inflorescence, mucilage during the period of the maturation of the seed, and the proteids, saline and bitter substances in the aftermath or later crop. The analyses of M. Boussingault give as the average percentage composition of ordinary hay—Water, from 13 to 16 parts; proteids, 7 to 13·5; sugars and starch, 44; woody tissue and cellulose, 24; fats, 4; ashes, 5 to 8 parts. A large proportion of the ashes consists of silex, and the remainder is nearly all composed of the salts of calcium, potassium, and sodium. The composition of oats is—Water, 12; proteids, 10 to 14; fats, 5 to 7; starches, gum, and sugar, 50 to 55; woody fibre, 10; and salts, 3. Of maize—Water, 13; proteids, 10 to 15; fat, 4·5; farinaceous compounds, 68·5; woody fibre, 2·5; ashes, 1·5. It may just be added that the proportion of nitrogen to carbohydrate in the different cereals is as follows:—wheat, 2·29 : 78·64; rye, 2·17 : 78·81; barley, 2·06 : 75·29; oats, 1·90 : 65·93; maize, 1·81 : 73·74; rice, 1·45 : 88·01; millet, 1·95 : 76·09. In green food the quantity of water

in 100 parts is very considerable, but when it is dried the total quantity of nitrogen is tolerably uniform, being in peas, 4·69; vetches, 5·57; turnips, 4·76; carrots, 2. It must be remembered that a considerable proportion of nitrogen is contained in other constituents of plants which are not proteids, and that they are not all capable of undergoing digestion. Thus, for example, more than half the nitrogen of lettuces, water-cress, and spinach exists in the form of nitrates, which are useless as flesh-formers; and the same holds with the amides of beet-root, potatoes, and unripe pulse.

In giving a connected account of the process of digestion in the horse of its ordinary food, hay and oats, the first point to be noted is, that in the mouth these substances are subjected to mastication and insalivation. The large and uneven surfaces of the molar teeth bruise and break down the stems and fruit of cereals, and the seeds of leguminous plants, enabling them to be more readily acted on by the several fluids of the alimentary canal. Simultaneously with this crushing process, the contraction of the muscles moving the jaws, and the stimulus of the sense of taste, causes an abundant secretion of saliva, the quantity having been ascertained by experiment to amount to between 80 and 90 lbs. per diem, most of which is reabsorbed in its further course down the alimentary canal. The saliva softens the food, enables it to be rolled into a coherent mass, and facilitates its deglutition. In addition, it exerts a powerful chemical action on the starchy compounds, for it contains a ferment named ptyalin which has the power of converting starch, through several intermediate stages, first into dextrin and then into a form of sugar named maltose. This action is termed diastatic or amylolytic, and has for its result the chemical union of water with starch, thus changing it from an insoluble substance into a soluble one; from starch, that is to say, which will not pass through an animal membrane and cannot therefore be absorbed, into sugar, which readily permeates the walls of the blood-vessels and lacteals. The ferment is most abundant, or most active, in the saliva which flows from the parotid gland. It has not indeed been isolated, but it is known to act far more energetically on boiled than on raw starch. The presence of dextrin, maltose and a little grape-sugar, after the addition of saliva to boiled starch, is easily demonstrable after a minute or two; whilst with raw starch, especially in the case of wheat starch and potato starch, a much longer time is required. The proteids and oils of the food undergo no change in the mouth.

Gastric digestion.—Having traversed the œsophagus or gullet, the crushed and moistened food enters the stomach and is immediately subjected to the action of the acid gastric juice. This is a clear fluid which is secreted by the innumerable minute glands in response to the stimulus imparted to the mucous membrane by the presence of food. The acidity of

the gastric juice is due to hydrochloric acid, which exists in the proportion of about two parts in 100 of the juice, though occasionally the butyric or phosphoric acid may be also present. In addition to the acid there is also a ferment named *pepsine*, and the acid and the pepsine together are the main agents in the process of gastric digestion in the adult horse. In the foal there is a second ferment, which coagulates and acts on the casein of milk. The action of the ferment and acid is chiefly exerted upon the proteids or nitrogenous constituents of the food, which it causes to swell up, dissolve, and undergo a chemical change into soluble peptones.

In regard to the oils, the only change that takes place in them in gastric digestion is that their cell walls are dissolved and the oil set free; and although no chemical action is exerted upon the oil, the constant churning movements to which the food is subjected by the stomach reduces it to the condition of an emulsion. The starches are not acted upon by the gastric juice, but the food is so thoroughly impregnated with saliva that probably the action of that fluid is continued in the stomach. Solution and absorption of peptones, salts, and sugars takes place to a certain extent in the stomach, but a portion of these substances mingled with the emulsified oils filter through the pyloric orifice into the duodenum, or first part of the intestine. Towards the close of digestion the pylorus or right opening of the stomach relaxes to a greater degree, and the remains of the meal enter the intestine.

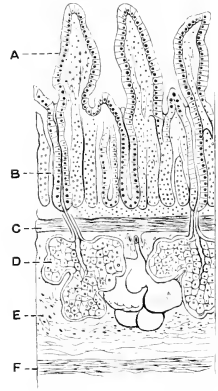


Fig. 91.—Section through the Duodenum, showing Brunner's Glands

A, Villus. B, Follicle of Lieberkühn. C, Muscularis mucosæ. D, Brunner's gland. E, Connective tissue. F, Muscular coat.

Gastric digestion in the horse lasts about three hours, but is accelerated if water is ingested. The observations of Colin show that the successive portions of food swallowed retain to a considerable extent the order in which they have been ingested, and do not mix together much if no water is given.

Intestinal digestion.—As soon as the chyme has passed from the stomach into the intestine it excites the flow of bile from the liver, of pancreatic juice from the pancreas, and of intestinal fluid from the numerous Lieberkühnian follicles and glands of Brunner that are distributed through the mucous membrane. All these fluids are alkaline, and hence the reaction

changes, so that from being acid the chyme becomes alkaline. The bile not only neutralizes the acidity of the latter, but it aids in the emulsification and saponification of the oils and fats. It also promotes their absorption, and it acts as a stimulant to the muscular walls of the intestine, causing them to contract, and assisting in this way the onward movement of the intestinal contents. It seems to interfere with or arrest the further action of the gastric juice on the proteids. That action, however, is recommenced by the pancreatic juice, which can form soluble peptones from the insoluble proteids in an alkaline medium, just as the gastric juice did in an acid one. The pancreatic juice is in fact the most important of the digestive fluids. Comparatively small in quantity, coagulating into a solid mass by heat, it is found to contain three ferments, named *trypsin*, *steapsin*, and *amylopsin*. Trypsin converts proteids into soluble peptones, but in a somewhat different way from that in which the change is effected by gastric juice, and it can carry the change one step further by decomposing them into leucin and tyrosin. Steapsin possesses the power first of emulsionizing and then of saponifying the oleaginous compounds, thus aiding in their absorption; and lastly—the amylopsin effects similar changes in the starches to those which we have just seen are accomplished by the saliva.

The intestinal juice appears to have an action resembling, though less powerful than, that of the pancreatic secretion, acting upon all the organic constituents of the food, rendering them soluble and aiding in their absorption.

From the small intestine the now greatly modified food mass passes into the large intestine; and when the enormous capacity of the cæcum and colon are considered, it is difficult to avoid the conclusion that a still further effort is made to convert the materials that have hitherto successfully resisted the warmth, moisture, and powerful action of the several digestive fluids secreted by the salivary glands, the stomach, liver, pancreas, and intestinal mucous membrane, into useful nutritive substances, and at the same time to effect their absorption. A considerable development of infusory animalcules, as well as of micro-organisms in the form of bacilli and micrococci, takes place in the large intestine. This subject may be concluded by giving the results of the observations of Colin in regard to the progress of the food through the alimentary canal. He kept the animals fasting for twenty-four hours from solids and liquid, then fed them with about $5\frac{1}{2}$ lbs. of hay, and about $2\frac{1}{2}$ gallons of water, to which must be added an estimated equal quantity of saliva, and killed them at different periods. Two hours after the beginning of the meal the stomach had passed into the intestine one-half in weight of all that had been ingested; two-fifths of the dry hay had been retained, the remaining three-fifths had

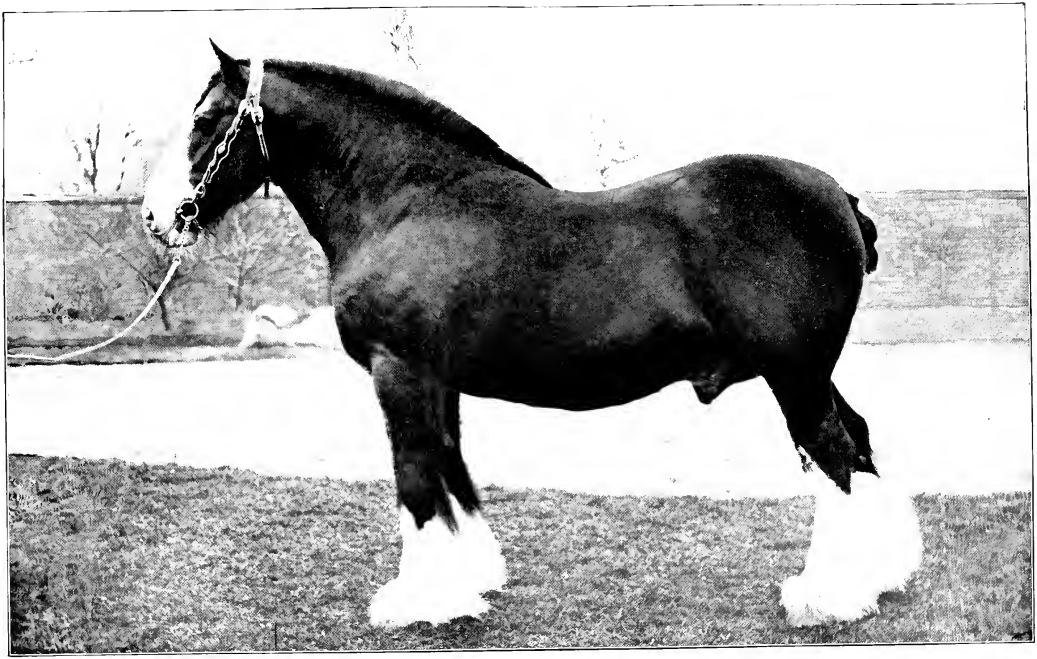


PLATE XXIII.

STROXTON TOM 15871

Bay Horse by Honest Tom 5123, dam, 20944 Stroxton Diamond. Winner of the Challenge Cup, S. H. S., 1903, and numerous other prizes
The Property of James Forshaw, Esq.

entered the small intestine, but one-fifth only was contained in the small intestine and cæcum, the missing two-fifths having been dissolved and absorbed. There was a great excess in the fluid owing to the addition of the gastric, biliary, pancreatic, and intestinal fluids. In another horse killed under the same circumstances, three hours after the meal a larger proportion of the solids had been absorbed, had entered the small intestine and had been passed on to the cæcum. After five hours only half the hay supplied could be recovered from the stomach, small intestine, and cæcum, the other half having been either dissolved and absorbed, or transmitted to the colon to be quickly ejected as excrementitious matter. Colin found some remains, though small in quantity, in the stomach after even so long a period as 36 or 38 hours. It would appear, then, that very soon after food is ingested it in part passes through the stomach and reaches the intestine and cæcum, in all of which digestion is simultaneously proceeding, the fluid that is added to it by the glands being least in the stomach, very large in the small intestine, and immense in the cæcum, and that absorption is taking place of the dissolved material in all these cavities.

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2. THE DIGESTIVE SYSTEM—ITS DISEASES AND INJURIES

DISEASES OF THE LIPS

The lips may become diseased from a variety of causes. In some instances the disease may be of constitutional origin, in others of a purely local character. Besides common ailments, these organs are also now and again the seat of specific eruptions arising in the course of contagious diseases. In addition to abrasions and other injuries, they are liable to suffer by exposure to such substances as lime or blistering material, used on the limbs and other parts without adequate precaution having been taken to prevent the animal from rubbing them with his muzzle. Vesicles or blisters and erosions may in this way be produced on the outer skin, making contact with dry food painful and chewing difficult.

Vesicles produced in this way generally run into one another, causing the skin to crack and ulcerate and the tissues of the lips to become swollen, and in this condition their mobility is more or less impaired and food is gathered with difficulty.

Old wooden mangers, splintered by animals affected with the vice of crib-biting, are sometimes responsible for sore lips, which are also induced

by improper removal of warts and by indiscriminate use of caustics so much in favour with old-world farriers. On the muzzle and lips of colts at pasture warts will sometimes form in countless numbers, and their proper treatment will come under consideration when speaking of diseases of the skin generally.

The angles of the mouth are also sometimes observed to be cracked, ulcerated, and inflamed, as a result of the use of sharp bits and the cruel and foolish practice adopted by breakers of the more ignorant class of placing blistering material upon them with a view to obviating "hard mouths". No method more calculated to defeat its object could be devised, as the ultimate result is thickening of a permanent nature and reduction of the sensibility of the parts. Oil of vitriol and sugar smeared upon the bit, with the object of producing a glossy coat, is another device of ignorant carters, resulting in sore lips.

The mucous membrane covering the inner side of the lips is liable to become injured from without by blows forcing it against the teeth, or from extension of inflammation from the corners of the mouth.

In certain forms of inflammation of the mouth, as well as in horse-pox, these organs are the seat of eruptions which may occur on one side or the other or both.

Treatment.—In this connection no great difficulty need be anticipated. Of the troubles we have been speaking, most can be successfully combated by remedies with which the patient himself will assist us. We refer, of course, to the use of warm, sloppy food, as bran mashes, boiled meal, pulped roots, scalded bread, and like emollients, which must necessarily be brought into contact with the parts affected and produce a good effect before the patient can swallow them. To guard against irritation of the injured surface, hay, corn, and chaff should be scalded and rendered soft and easy of mastication. Nature alone will sometimes effect repair with these simple precautions and the rest which they afford to the inflamed parts. Medicaments of the simplest kind should be chosen if any are needed. In alum solution we have almost a specific for sore places of this kind, though more active agents may be requisite where ulceration and indolent wounds require to be treated. It may be necessary to stimulate a pale, languid sore by touching it with a solution of nitrate of silver, or sulphate of copper (blue stone), or some other agent of a similar character, to induce the healing process.

A liberal dressing of vaseline or lard, to soften the skin, will afford the patient comfort, and should not be omitted in dealing with a delicate horse which is easily deterred from feeding. The old-fashioned remedy known as Friar's-Balsam has an excellent healing effect, and is a most suitable appli-

cation to lip wounds. It should be applied by means of a camel-hair brush morning and evening.

INFLAMMATION OF THE MOUTH (Stomatitis)

Inflammation of the mouth presents itself in a variety of forms, sometimes resulting in an eruption of white raised spots on the tongue, gums, and other parts of the cavity. In this form it is commonly spoken of as aphthæ or thrush. Another and altogether distinct variety of the disease is marked by a more intense and deep-seated inflammation, which soon causes death of the part attacked and ends in sloughing and deep-seated ulceration.

Simple stomatitis may be the result of a disordered stomach, or arise out of the administration of medicines insufficiently diluted, or the mistaken administration of liniments or embrocations for draughts. It results occasionally from the stings of wasps, as also from the irritating influence of acrid plants. In young animals it arises in the course of natural changes going on in the teeth, and in old ones from mechanical irritation and laceration (wounding) which the sharp and irregular edges of their teeth inflict on the tongue and cheeks in the act of feeding, and while the animal is being driven with the bit tightly drawn up in the mouth.

Symptoms.—The symptoms exhibited in this form of the disease are very characteristic. The mouth is filled with a thick ropy saliva and emits a disagreeable odour. The membrane lining it is red, hot, tender, and swollen, and in some cases the epithelium (outer surface) peels off from it in thin fragments. Food is taken cautiously, or altogether refused; or it may, after a few turns between the teeth, be cast from the mouth or, as it is termed, "quidded".

Cold water is eagerly sought after, and should an opportunity occur, the patient plunges the mouth into it and finds relief in its cooling effect on the inflamed and heated surface.

Should the irritation extend to the throat, as it sometimes will, difficulty may be experienced in swallowing, more especially solid food.

Treatment.—Treatment of this form of the disease must depend more especially upon the cause to which it is referred. Where it arises out of stomach derangement a dose of aperient medicine is called for. This may take the form of a suitable dose of aloes, to be given after two or three feeds of soft bran.

After the physic has ceased to act, tone may be imparted to the stomach and digestion assisted by the administration of a powder consisting of common salt, bicarbonate of potash, and gentian root, which should be

given in the food morning and evening. Careful dieting will also require to be observed until the mouth resumes its natural condition, and of course the bit must be withheld from it until this is effected.

In all cases of this disease the teeth should be carefully examined, and where irregularities are found to exist, they must be promptly corrected by the free use of the tooth rasp or other means, according to the nature of the disturbance. (See "Diseases of the Teeth".)

Inflammation resulting from stings and chemical irritants calls for physic and the application of soothing agents to the injured surface. A suitable electuary for the last-named purpose may be compounded by adding a little extract of belladonna to glycerine and treacle. Of this a small portion may be put into the mouth three or four times a day, or it may be swabbed over now and again with linseed-oil.

APHTHÆ

This form of inflammation of the mouth, occasionally seen in foals and other young creatures, is characterized by an eruption on the tongue and other parts of the membrane, and sometimes also on the lips. It resembles in its main features the malady termed "Thrush" in the human infant, and is believed to have its origin in a similar if not identical cause, viz.: a minute fungus or microscopic plant.

In certain states of the system this organism (*Oidium albicans*), on gaining access to the mouth, finds in the mucous membrane the necessary conditions for its growth and development, as the result of which inflammation is produced, at first in numerous small scattered centres, and later over a considerable surface of the cavity. In some cases it may reach the throat and extend to the air-passage, or pass downward along the gullet and invade the stomach.

Symptoms.—As we have previously remarked, aphthæ is a disease of early life, and seldom seen after the suckling period. Although characterized by an eruption in the mouth it is often attended by more or less constitutional disturbance, in connection with which derangement of the stomach is a marked feature. In some instances, however, it is of a mild character and passes away without attracting particular notice. In the more severe form it is ushered in by general signs of illness, of which dulness, a staring coat, and looseness of the bowels are the more conspicuous. An inspection of the mouth discloses a number of grayish-white spots scattered over the tongue, the cheeks, and other parts. These may be so numerous and closely packed as to run one into the other and spread over a large surface of the lining membrane. Later the mouth

becomes covered with sores, saliva hangs about the lips, and the breath becomes offensive. Where the disease invades the throat there is difficulty in swallowing. Disordered digestion is shown by looseness of the bowels or diarrhœa, and straining may be present, when the dung is sour and foul smelling. Very young foals when observed to let go the teat without obtaining satisfaction, or when presenting a tucked-up appearance, should be examined as to their mouth. The reader familiar with sucking colts is of course aware that in health they make very frequent visits to the maternal bottle, taking short intervals of rest, varied with gallops, and returning for more nourishment in a few minutes; but a colt with a sore mouth will probably drop his ears and shake his head while trying again and again to lay hold of the teat.

Treatment.—In dealing with this disease it is important to remember that any unwholesome condition of the milk of the dam will not only predispose to it, but likewise tend to aggravate it when once it has become established. Attention, therefore, should be directed to the health of the mare, and care be taken that the food and water she receives is not only of good quality but suited to her condition as a matron. Should she be at all out of health a little laxative or alterative medicine should be prescribed at once and the diet carefully selected and administered. If the dam is being worked it would be desirable to discontinue her services and restrict her movements to gentle exercise. In addition her teats and udder should be sponged with a five per cent solution of carbolic acid morning and evening.

With regard to the foal, a small dose of castor-oil at the outset of the disease, in a little warm milk, will be found of considerable advantage in cleansing the stomach and bowels from the offensive and irritating matters they contain, and aid at the same time in subduing the existing inflammation of the mouth. This may be followed by 10- to 30-grain doses of bicarbonate of potash, morning and evening, in a little of the mare's milk.

Although in slight cases the disorder in the mouth may pass off without interference on the part of the attendant, its duration will be shortened and the creature's comfort considerably enhanced by the judicious use of simple remedies—as sponging out the mouth with weak vinegar and water, or a solution of alum, or the application of borax and honey, or a mixture of glycerine and tannic acid, to the affected parts. Should the disease of the mouth be severe, and continue to divert the foal from the teat, debility and exhaustion must be guarded against by drenching the little patient with milk from the mare, or it may be encouraged to take small quantities from time to time off the palm of the hand. We have

known a sponge saturated with milk to prove a useful vehicle for conveying it into the mouth when the teat has been refused. These artificial means of feeding, however, should be discontinued as soon as possible, or the youngster may acquire bad habits and prove troublesome later on. Weakness and prostration in these cases must be met by the administration of small doses of brandy added to the milk and potash prescribed above, and the little sufferer should be kept warm and protected from draught.

INFLAMMATION OF THE TONGUE (Glossitis)

By glossitis is understood an inflamed condition of the substance of the tongue. It is a disease of seldom occurrence in the horse and usually attended with some danger, not only on account of its immediate effects, but also in consequence of its liability to leave behind chronic impairment of the function of the organ, with attendant difficulties of mastication and deglutition or swallowing.

Causes.—With rare exceptions inflammation of the tongue has its origin in some form of direct irritation applied to it from without. Although so favourably situated and guarded it is nevertheless at times exposed to mechanical injury. The reckless use of too severe bits, splinters of wood, nails, and other foreign substances contained in the food, bottles broken in the act of drenching, forcible pulling and tearing the organ in the administration of balls and other operations are now and again accountable for the disease. The most common, but rarely serious, injury to the tongue is that inflicted by the edges of the molar teeth, or, as they are termed, "grinders", which in old horses become very sharp and irregular as the result of wear. A similar injury may befall young animals when shedding their suckling teeth. It does not follow that general inflammation of the tongue should necessarily result from any of these accidents. Were it so the disease would be of common occurrence. When, however, the wounds so inflicted become "poisoned", *i.e.* inoculated by decomposing organic matter—as likely occurred in the historic *Orme* case,—then to the primary injury is added a septic or putrid condition resulting in diffused inflammation of the entire organ. In some cases the sting of a bee or a wasp may be the inducing cause, as may also chemical and corrosive substances, accidentally or designedly given.

Symptoms.—The tongue is more or less enlarged sometimes throughout its entire substance, and may protrude from the mouth for a considerable distance. In this state it is hard, tense, and painful to the touch. At first red in colour, it soon becomes of a dark purple hue as the teeth close upon it and impede circulation. Thick ropy saliva, having

an offensive odour, falls from the angles of the mouth, the head is poked out, and the face wears an anxious and hideous expression.

In very acute cases the throat and neighbouring glands become swollen, as the result of which the breathing is rendered difficult and noisy, even to danger of suffocation. The constitutional disturbance will be in proportion to the severity of the attack. The enlarged and paralysed state of the tongue renders feeding and drinking impossible, save in the milder forms of the disease.

Where the disease is protracted, abscesses may form in the substance of the organ, or the surface may become eroded and covered with sores.

Treatment.—When the case is recognized in its first stage a dose of physic should be given at once, either as a ball or draught, while it is still practicable. It is dangerous, however, to attempt this when the tongue has become much enlarged or torn, but it may be possible to induce the animal to take an aperient dose of Epsom-salts dissolved in the drinking-water or mixed with a sloppy mash. Prompt application of mustard or turpentine liniment to the sides of the throat and between the jaws will assist in checking the progress of the disease; and relief to engorged vessels and swollen tissues may be afforded by scarification, *i.e.* piercing the organ in several places with the point of a lancet or sharp penknife. When this operation is rendered necessary, care should be taken that the mouth is first washed out with antiseptic solution, and that the instrument employed is clean, or the mischief may be seriously increased.

The mouth should now be syringed out for ten minutes with warm water containing a little nitrate or chlorate of potash. After the lapse of an hour ice-cold water should be substituted for warm, and the injections should be repeated for several minutes four or five times a day. If nourishment cannot be taken by the mouth, it must be given per rectum in the form of fine oatmeal gruel and beef-tea, or raw eggs and milk.

Where suffocation threatens, an opening will require to be made in the wind-pipe. This procedure, as well as the one already referred to, calls for skill and judgment, and should be entrusted to a qualified veterinarian.

After the inflammation has subsided, the tongue will continue to be stiff and sore for some time. When feeding becomes possible, therefore, the diet should be of a soft and soothing character. Warm, sloppy mashes, well boiled roots, and steamed chaff are the most suitable fare until the tongue has recovered its normal condition.

In all cases a careful inspection of the tongue and teeth should be made at the outset for causes indicated above. Foreign agents, if found to exist, will require to be removed, and any dental disorder corrected by suitable means. (See "Diseases of Teeth".)

CONGESTION OF THE PALATE (LAMPAS)

Lampas is a congested state of that portion of the palate situated immediately behind the upper row of front teeth. It is mostly seen in young animals during the period when the teeth are being changed, but adult horses are also liable to it as the result of disorders affecting the stomach and bowels, and as an accompaniment of fever attacks.

It is of no great consequence in itself, but has been regarded with exaggerated importance for generations past, and has been the pretext for endless cruelty by ignorant grooms and pretenders to the art of horse surgery.

Symptoms.—In this state of the palate the act of feeding is materially interfered with, and the horse is noticed to fail in his appetite or drop the food from his mouth. Examination of the palate shows the membrane to be swollen and to extend below the teeth. It is red, tense, and painful to the touch, and not infrequently attended with slight fever and general constitutional disturbance.

Treatment.—In large numbers of instances swollen palate is of a temporary or passing nature, and subsides without medical or surgical interference; but the severity and continuance of some cases call for special attention. In these it may be desirable to scarify the palate with a sharp, clean lancet or penknife, and remove a few ounces of blood; or, in the case of digestive troubles, a dose of physic, followed by a short period of dieting, will be sufficient to effect a cure.

While the pain and swelling continues, the food will be rendered more agreeable to the patient by being damped or scalded. It need hardly be said that the practice of burning the "bars" with a hot iron is barbarous and useless, and it should be generally known that such acts are cruel and punishable by law.

INFLAMMATION OF THE THROAT (PHARYNGITIS)

Sore throat, as this disease is commonly termed, is an ailment of frequent occurrence in the horse, appearing on some occasions in the course of one or another of the contagious fevers to which this animal is liable, and on others as an independent local affection, the result of cold. Young horses suffer most frequently and severely, and especially when transferred from the pure air of the open pasture to the foul atmosphere of the stable.

The disease is usually limited to the vascular membrane lining the cavity, and may be of the mildest description. In this case it passes

away quickly without causing much inconvenience or suffering to the patient. In other instances, however, it extends deep into the tissues of the throat and neighbouring glands, giving rise to the formation of abscess, with its attendant suffering and danger.

Causes.—Sore throat often follows upon exposure to inclement weather and sudden changes of temperature, when it appears as part of a common cold. Spring and autumn, while the hair is being shed and a new coat produced, are the times of greatest susceptibility to this form of the malady, and the liability to contract it is materially increased by the depressing influence of over-work and close, foul stables. It may also arise from direct injury inflicted by the lodgment of foreign substances swallowed with the food, or from chemical irritants administered by mistake or otherwise, and it has been suggested that the throat sometimes becomes irritated and inflamed in the colt as the result of "teething".

It almost invariably exists to a greater or less extent associated with "strangles", in which we experience the most severe and dangerous examples of the disease. In certain outbreaks of influenza, catarrhal sore throat is a special feature of the disorder, while in others it is of seldom occurrence. It is difficult to assign a reason for this discrepancy, but probably it may be in some way connected with atmospheric constitution.

Inflammation affecting the mouth not infrequently extends to the throat unless kept under control.

Symptoms.—The symptoms of pharyngitis or sore throat vary with the severity of the disease, but they are, nevertheless, very characteristic. Difficulty or inability to swallow is the most striking feature of the affection.

The food, after mastication, is held in the mouth for a brief period before any attempt is made to swallow, and then it is suddenly bolted, while the head is sharply raised or jerked to one side as the effect of pain. The throat may show some fulness, and pressure applied from without excites pain. The glands are sometimes enlarged and tender, in which case the head will be poked out and carried somewhat stiffly. Where the impediment to swallowing is considerable, some of the water returns through the nostrils in the act of drinking, carrying with it fragments of masticated food.

In cases where the disease extends to the respiratory passage there will be coughing, especially with each attempt to swallow. In this disease the mouth contains a large quantity of thick saliva, some of which trickles from the corners and hangs from the lips in ropy lengths.

In rare instances the inflammatory action results in suppuration and the formation of an abscess. Here the breathing is rendered difficult and

noisy, the body temperature is raised, the pulse quickened, and marked constitutional disturbance exists. After maturing, the abscess breaks either outwardly or inwardly, in the latter case discharging the matter (pus) through the nostrils, when the patient experiences immediate and obvious relief.

Treatment.—The course to be adopted in dealing with this disease will depend very much on the severity of the attack. In a large number of instances a short course of warm, sloppy diet, enjoined with a few days' rest and careful nursing, is all that is required to bring about recovery. If, however, the attack assumes an acute character, then treatment must be of a more active kind. Here applications to the throat, both externally and internally, will be necessary. Outwardly a mustard poultice, or flannel bandages wrung out in hot water and frequently renewed should be resorted to, while hot vapour is conveyed to the inflamed part by inhalation from a nose-bag containing bran, or what is better, sawdust saturated with boiling water. A little electuary, composed of extract of belladonna, nitrate of potash, and treacle, should be deposited on the tongue four or five times a day by means of a stick. The patient will suck it in, and in this way the throat may be anointed and soothed without subjecting him to the annoyance and excitement of drenching.

In all cases of this kind the bowels should be gently moved. For this purpose 2 to 4 ounces of sulphate of magnesia may be given in a feed of scalded bran, and repeated at intervals of twenty-four hours three or four times if necessary, or it may be given in the drinking-water if the patient prefers that mode of taking it. Where outward swelling of the throat appears, the part should be freely fomented and poulticed. One of two results may be expected to follow this line of treatment: either the swelling will become resolved and disappear, or an abscess will develop in its substance. The latter will be made known by the appearance of a soft, moist, fluctuating spot on some part of the surface. When this state has been reached the abscess must be laid open and its contents allowed to escape. In the event of its "pointing" inwards the matter will, as we have already indicated, pass out by the nostrils. In either case instant relief will follow, and should no intercurrent drawback arise, a speedy recovery may be anticipated.

At this stage of the disease, treatment must be mainly directed towards improving the general condition and re-establishing convalescence, while at the same time tone must be given to the diseased parts. In the first connection a plentiful supply of good food will be needed, but it is most desirable that it should be judiciously selected and prepared. Scalded corn and chaff with bran, and a little boiled linseed, form a suitable diet

at this time. It should, however, be given in small quantities and often. Where bodily weakness is very marked, two or three eggs may be added to the diet as many times a day, and an ounce or two of alcohol may with advantage be mixed with the drinking-water morning and evening. Later on, and as the animal recovers appetite and strength, mineral and vegetable tonics in the form of sulphate of iron and gentian will aid in bringing about complete restoration to health.

ABSCESS OF THE THROAT

The growth of abscess in this situation is of seldom occurrence, except in connection with strangles. Occasionally, however, it results from the lodgment of a foreign body in the throat, as a thorn, thistle-prick, splinter of wood, pin, fine nail, or other similar substance. Pharyngitis proceeding from a severe cold sometimes terminates in the formation of an abscess.

Symptoms.—These, in the first instance, simulate an ordinary sore throat, and later, according to the situation and extent of the swelling, give evidence of considerable suffering and distress. With the progress of the abscess swallowing becomes difficult if not altogether impossible. When attempted, pain is denoted by the spasmodic movement of the head to one side as the bolus enters the pharynx, or if water is being taken much of it will return down the nostrils.

The head is extended on the neck, and, when turning, is moved stiffly round. More or less general enlargement will appear about the throat, and if the abscess be superficial a special prominence will be observed at the point where it is being formed. In cases where it is deeply seated and "pointing" inward there may be but little outward swelling to mark its presence, and should it break internally and the matter pass down the throat, as is sometimes the case, all evidence of its having existed will disappear, but it will not be overlooked that the patient's pain and suffering has suddenly disappeared with it.

The presence and disruption of an abscess will sometimes be indicated by a copious discharge of matter from the nostrils and a simultaneous subsidence of the acute symptoms and return of the power of deglutition. It not infrequently happens that these throat abscesses break during a sharp fit of coughing, which mostly occurs from time to time during their formation.

Slight fever will exist while the abscess is in the process of development, but this will quickly subside after it has broken and emptied itself.

Treatment.—This must be directed towards maturing the abscess

and keeping down the fever which attends its development. The former may be assisted by poulticing the throat continuously and allowing the animal to inhale warm vapour from a bran mash at the bottom of a nose-bag. A little electuary of belladonna and treacle rubbed up with a little powdered chlorate of potash will diminish local pain. A small quantity should be put into the mouth three or four times a day by means of a spatula made out of a piece of stick.

A dram and a half of nitrate of potash in the drinking-water or in sloppy bran mash may be all that is needful in the way of medicine. During the formation of abscess in the throat no attempt should be made to give draughts or balls. If the fever runs high 2 ounces of alcohol should be given in the drinking-water three or four times a day and the body should be kept warm by ample clothing and bandages to the legs. Where the abscess points outwardly it should be freely laid open by means of a clean lancet so soon as it is found to fluctuate under pressure of the finger.

Plenty of fresh air and a clean apartment are necessary adjuncts to medical treatment.

SALIVATION, OR PTYALISM

This disease consists in an excessive secretion of saliva, and may result from various causes—some acting directly on the salivary organs themselves, others exciting their undue action by irritating remote parts. Injuries and eruptions in the mouth, from whatever cause, will induce it. A knowledge of this fact should lead to an inspection of the mouth on all occasions where saliva is unduly secreted. Nor should it be overlooked that sharp and dirty "bits" may excite the necessary irritation, as may also some chemicals, and acrid plants. In man mercury is a common cause, and the same results follow its repeated administration in the horse. It is frequently present in the disorders above referred to, and occasionally arises from indigestion and gastric irritation. On rare occasions it is seen as the result of neuralgia and other forms of nervous disturbance.

Symptoms.—Foaming at the mouth while feeding very commonly results from salivation, and in the absence of food, the animal, if watched, will be seen to be repeatedly swallowing, while at the same time saliva drivels from the mouth.

Treatment.—Where the disorder is due to some mechanical or chemical irritant the cause should be removed. Where the edges of the teeth are sharp, the tooth-rasp must be freely applied to them.

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Indigestion must be met by a dose of physic and careful dieting, and in any case the mouth should be irrigated twice or thrice a day with a weak solution of chlorate of potash or alum.

INFLAMMATION OF THE PAROTID GLANDS (Parotitis)

In its local manifestations this disease resembles the human ailment usually described as "mumps", but the two affections are quite distinct from each other. Mumps is a specific contagious fever communicable from person to person. There is no distinct disease of the salivary glands in

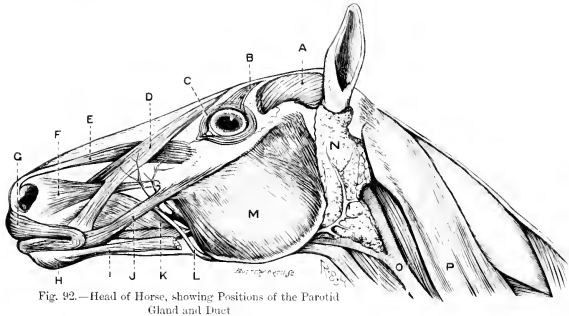


Fig. 92.—Head of Horse, showing Positions of the Parotid Gland and Duct

A, Temporalis muscle. B, Levator palpebræ. C, Orbicularis palpebrarum. D, Supernaso-labialis or Levator labii sup. alæque nasi. E, Supermaxilo labialis or Levator labii superioris proprius. F, Supermaxilo nasalis or Dilator naris lateralis. G, Orbicularis oris. H, Mento-labialis. I, Maxilo-labialis or Depressor labii inferioris. J, Zygomaticus. K, Bucenator. L, Parotid duct. M, Masseter muscle. N, Parotid gland. O, Jugular vein. P, Mastoido-humeralis muscle.

the horse possessing infectious properties, although they not infrequently become inflamed in the course of infectious diseases of another sort.

Causes.—Inflammation of the parotid gland (fig. 93, p. 260), as it occurs in the horse, is mostly a symptomatic affection arising in the course of an attack of strangles or influenza. In some exceptional cases it results from cold, and we have known it to be induced by the entrance of foreign matter into the excretory duct which conveys saliva into the mouth.

Symptoms.—Parotitis may be acute, when the inflammatory action is severe and sometimes results in the formation of an abscess in the substance of the gland, or it may pursue a chronic and abiding course ending in permanent enlargement and induration of the organ affected. Indications of the disease in the former case are marked by an enlarge-

ment extending from below the ear downwards towards the throat. The swelling is hot and painful to the touch; at first hard and resisting, but, should suppuration take place, a soft fluctuating point appears, denoting the formation of abscess. In this condition the head is extended and the nose poked out (fig. 93), there is some trouble in swallowing, and the breathing becomes difficult, and is sometimes accompanied by a loud roaring sound. Should the abscess point inwards instead of coming to the surface, it may be expected to break into the throat. This will be made known by an escape of white matter down the nostrils and a sudden subsidence of the more acute symptoms. The difficulty in swallowing will now disappear almost at once, and any abnormal sound that may have been emitted in breathing is no longer heard. The constitutional disturbance which may have existed will now subside and the general health become re-established. In less severe attacks the swelling of the gland is inconsiderable, and there is no disposition to form matter. In these cases the enlargement may altogether subside, or in part remain permanent in the gland.

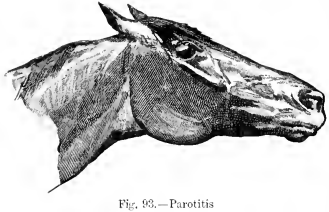


Fig. 93.—Parotitis

Treatment.—The object of treatment should be to subdue local inflammation and cut short the disease, thus guarding against those extreme structural changes involved in the formation of an abscess, as well as that too common consequence—roaring. Hot poultices to the throat should be promptly applied, and these may be continued without intermission until the disease subsides. Where poulticing cannot be thoroughly carried out, and frequent changes made, as sometimes occurs, it is better to rely on counter-irritation. This may take the form of a mustard poultice, or turpentine liniment, or a mild dressing of the oil of cantharides—one or the other—repeated thrice or oftener, as may be required.

Where swallowing is difficult and the formation of an abscess internally is suspected, the ripening of the abscess will be hastened by repeated fumigation of the throat with the vapour of hot water to which turpentine has been added. This may be accomplished by means of a nose-bag containing scalded bran, over which a little oil of turpentine has been sprinkled, or the saw-dust of pine-wood will answer the purpose equally well. A small quantity of belladonna electuary inserted into the mouth two or three times a day will also assist in subduing local pain and add to the comfort of the patient.

Well-scalded bran and oatmeal, with pulped roots, and a liberal allowance of linseed gruel, will form a suitable diet, and the addition of iron and vegetable tonics may also be required to uphold the strength and hasten recovery. Careful search should be made from time to time for the formation of abscess, and so soon as it is found to "point", *i.e.* fluctuate under pressure of the finger, it must be freely opened and the matter allowed to escape. All that is now required is to keep the wound clean by sponging it with antiseptic solution, and protecting it by a pad of cotton-wool under a bandage.

If after the wound is healed the gland still remains enlarged, a cantharides or iodine blister ought to be promptly applied and repeated if necessary.

FISTULA OF THE PAROTID DUCT

The parotid duct, or duct of Stenson, is the vessel or canal by which saliva is conveyed from the salivary gland into the mouth. On leaving the gland the parotid duct (fig. 92, p. 259) passes along the inner surface of the lower jaw, and then winds round its lower border in front of the great muscle of the cheek in company with the inferior maxillary artery and vein, and finally opens into the mouth opposite to the junction of the second with the third molar tooth of the upper jaw. In its course round the jaw-bone and along the side of the face it becomes exposed to injury, and as the result of blows from the kicks of horses and other mishaps as well as from the ulcerating effects of calculi (stones) which sometimes form within it, an opening is made through its walls at the seat of injury by which the saliva is allowed to escape instead of passing into the mouth. The duct may be completely divided, as sometimes occurs from external violence, in which case one portion of the vessel is separated from the other, or it may only be punctured. Obviously the former condition is the more serious of the two, since the divided ends draw away from each other and are with difficulty brought together under the most favourable circumstances; and if allowed to remain apart for any length of time that portion connected with the mouth closes up, owing partly to no saliva being able to enter it, but more immediately as the result of inflammation excited in it by the accident. Fistula of the parotid duct may also result from the formation of an abscess in some part of its course giving rise to ulceration of its walls.

Symptoms.—The existence of this disease is known when a watery fluid is found to discharge through an opening in the skin at or near the lower border of the jaw (fig. 94). The quantity will depend a good deal

upon the size of the opening and also upon the act of mastication. When feeding, the secretion of saliva is most active and the flow is very considerable, but becomes comparatively slight when food ceases to be taken.

Treatment.—The indications here are to close the external wound promptly, and by so doing cause the saliva to flow along and keep open its proper channel and allow the rent in the vessel to heal. Success will greatly depend upon:

1. Whether the vessel is partially or completely divided.

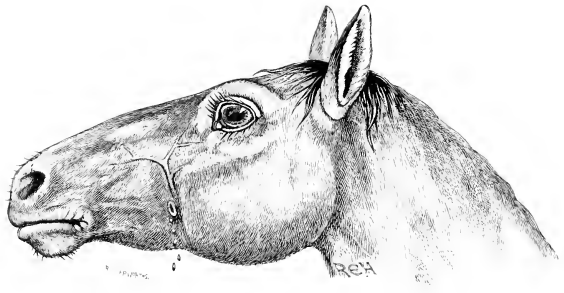


Fig. 94.—Fistula of the Parotid Duct

2. Upon the period of time which is allowed to elapse between the injury and recourse to treatment.

3. As to the state of the duct itself.

When the duct is cut through, or its walls are involved in an ulcerative condition, the prospects of cure are remote; when, however, the duct is simply perforated it is more favourable.

Whatever treatment is undertaken, solid food must be altogether withheld for three or four days, or more if necessary, and the patient supported on liquid aliment such as thin oatmeal and maltmeal gruel mixed with eggs, beef-tea, and milk alternately, the object being to keep the jaws at rest and the secretion of the saliva as far as possible in abeyance.

The hair must now be removed from about the wound and the part thoroughly cleansed with soap and water and afterwards freely irrigated with a solution of carbolic acid. With a small needle and catgut-thread the lips of the wound are then to be carefully and completely drawn together, in doing which a sufficient hold should be taken of the skin to guard against tearing out. The part is then to be covered by a thick

dressing of styptic-colloid and covered with a thick pad of antiseptic wool or absorbent lint.

When necessary both should be renewed but not otherwise, and the animal is to be so secured that he may not rub or otherwise disturb the application.

By some, closure of the wound is attempted to be brought about by the production of a scab, and for this purpose it is freely dressed with caustic, such as nitrate of silver, nitric acid, or the hot iron.

In old-standing cases, where the wound has become callous and that part of the duct near the mouth closed up and impermeable, the salivary gland should be destroyed, and the formation and discharge of saliva from it altogether arrested. This is accomplished by injecting some irritant along the duct into the gland. For this purpose a solution of one of the following drugs is employed, viz.:—Nitrate of silver, caustic ammonia, or tincture of iodine. The immediate effect of this course is to cause inflammation and swelling of the gland, sometimes also the production of an abscess; the ultimate result, however, is that the organ is spoilt, ceases to secrete saliva, and wastes away. After this has been effected some little defect in mastication will be observed for a short time, and it may be that an attack of indigestion may follow, but with care in feeding and management this will soon cease to be a matter of concern.

SALIVARY CALCULI

Although of rare occurrence calculi are now and again met with in the course of the salivary ducts, and more especially in that one which conveys the saliva from the parotid gland into the mouth. Salivary calculi are of a grayish-white hue, very dense, and rough on one surface. When existing alone they are rounded or elongated, but when two or more occur together in the same duct they present a more or less irregular form owing to the friction they exercise upon each other during the movement of the jaws in mastication. Some specimens are very small while others (fig. 95) reach several ounces in weight and four or more inches in length. The longer calculi are usually somewhat concave on the side nearest to the lower border of the jaw over which the duct passes.

Chemically they are found to consist of carbonate and phosphate of lime and a small quantity of animal matter. Carbonate of lime is the chief constituent, and forms from eighty to ninety per cent of the whole.

The formation of these stones is provoked by any obstructive cause which prevents the escape and favours the accumulation of salivary fluid in the duct, or by the entrance into it of small particles of grit or other

foreign matter such as hay, straw, &c., upon which the salts contained in the fluid will gather in a succession of superimposed layers.

Symptoms.—It is not until the stone or stones have reached a considerable size that salivary calculi are recognized. Attention is first directed to them by a small bulging on the lower border of the jaw, or the groom's hand is brought into contact with them when the horse is being cleaned. When of large size a considerable enlargement appears on the site of the growth, which on manipulation is found to be sharply circumscribed and movable on the jaw.

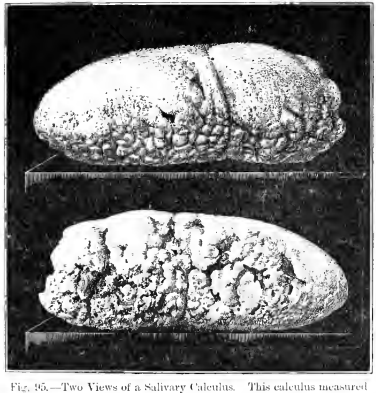


Fig. 95.—Two Views of a Salivary Calculus. This calculus measured four inches in length

In some instances the skin and underlying tissue around the growth are considerably thickened as the result of irritation provoked by blows. The escape of the salivary fluid being interfered with, it is made to collect and distend the duct along its course towards the gland.

Treatment.—Where the stone is discovered while still small an attempt may be made to force it upward along the duct and out into the mouth, but this will need the greatest care and most gentle manipulation. Large stones, which cannot be so expelled, must be removed bodily.

Preliminary to an operation the hair must be removed either by close clipping or shaving, the skin is then thoroughly washed and brushed with soap and warm water, and afterwards dried and irrigated with a five-per-cent solution of carbolic acid. An incision is now made through the skin, and the duct laid open either transversely or longitudinally, just so far as to allow the removal of the stone. The divided edges of the duct are then carefully brought together with catgut sutures, and having thoroughly cleansed the wound from blood, and freely irrigated it with carbolic solution, the edges of the skin are brought together and the part covered with sterilized wool. After the operation is completed the patient should

be tied in pillar reins and kept without solid food for from forty-eight to fifty-six hours.

CHOKING

Choking results when some solid body or substance becomes fixed in some part of the œsophagus or gullet. In this condition swallowing is either imperfectly performed or rendered altogether impossible, according to the size and form of the object, and in some measure also to the position occupied by it. This mishap is of seldom occurrence in the horse, but in the ox, whose food is but imperfectly chewed prior to *rumination*, it is comparatively common.

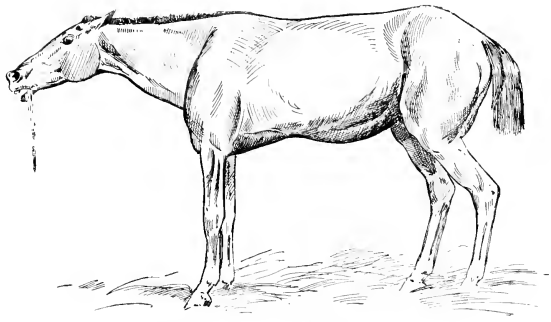


Fig. 96.—Choking in the Throat

Various substances have been found from time to time to obstruct the gullet. Eggs and onions, given by grooms with the idea of improving the condition of the horse, have on several occasions resulted in choking. Pieces of carrot, turnip, and mangold, balls, hay imperfectly masticated and hurriedly swallowed, thorns, pieces of stick, wire, &c., are among the more common offenders. The situation of the obstruction varies in different cases. Sometimes it is high up in the throat, at others in the course of the neck, and in some instances low down in the chest, near to the stomach. Whether it be in one position or the other it is a state involving considerable difficulty and danger, and requires to be dealt with promptly and deliberately.

Symptoms.—The symptoms of choking are not always the same, the difference depending upon the seat and nature of the object causing it.

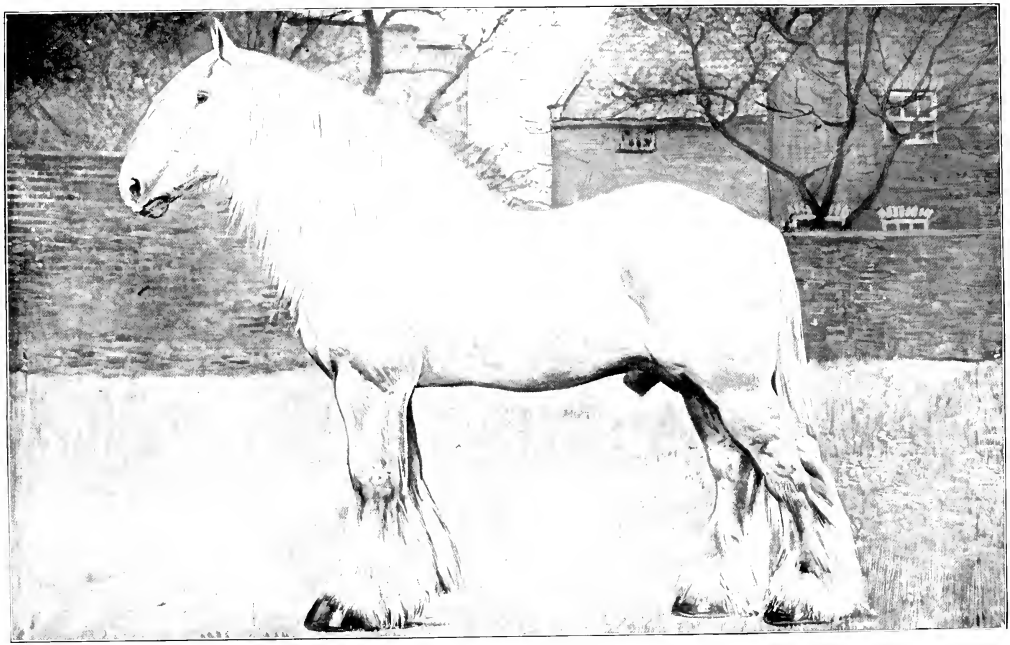
Although certain well-marked signs of the accident are usually present there are cases in which a diagnosis is difficult to accomplish.

Where the impediment is in the throat the symptoms are such as may be mistaken for ordinary sore throat. The nose is poked out and the head is carried somewhat stiffly (fig. 96). Repeated attempts are made to swallow, each effort being attended with marked pain. The jaws are moved restlessly about, and a discharge of saliva issues from the mouth. Food is refused, and should an attempt be made to drink, some of the fluid will pass down the nostrils and some may enter the respiratory passage and provoke an outburst of convulsive coughing.

Pressure on the throat causes pain and may reveal the presence of the offending body. These symptoms are specially marked in the case of thorns, sticks, and other pointed substances. Should the obstructing mass be large, and cause pressure on the windpipe, the breathing will be interfered with, and may be very difficult and noisy, with heaving at the flanks and general indications of distress.

Choking in the course of the neck and in that part of the gullet which passes through the chest is attended by violent retching and attempts to vomit. During the paroxysms or fits, the muscles of the neck are first violently contracted, the chin is forcibly drawn towards the breast, and the crest is sharply arched (fig. 97). At this time the eyes stare, the face wears a painful and anxious expression, and ultimately the muscles of the entire trunk become more or less convulsed. Any impediment lodged between the throat and the lower third of the neck will be readily felt, and in cases of high choking are distinctly recognized as a bulging in the channel of the neck. Should relief be long delayed the body becomes swollen up with gas, and with it abdominal pain occurs as the result of impaired digestion.

Treatment.—Here the object is clearly to remove the obstruction. Haste and excitement are to be avoided in dealing with this as with all other accidents, but no time should be lost in devising means for freeing the passage from the object obstructing it. Any suspicion of trouble in the throat must be promptly acted upon—nay, it is good practice in all cases where doubt exists as to the seat of the stoppage to introduce the hand into the mouth and thoroughly explore the pharynx or cavity behind. Should the offending body be found there, careful handling usually suffices to effect its removal. Where the impediment is seated in the neck, an attempt should be made to move it upward or downward by gentle pressure, first in one direction then in the other. This will be facilitated by first giving the patient a small quantity of linseed-oil. Imperfectly chewed hay or straw may be broken down, by careful manipulation from without, and



SHIRE HORSE: LINCOLNSHIRE LAD II

By Lincolnshire Lad 1196; dam, Madam by Matchless 1506. The Property of F. Crisp, Esq.

PLATE XXIV.

caused to disperse, but solid substances will require to be bodily removed. If this cannot be accomplished by the means suggested, the probang or "choke rope" must be introduced. In performing this operation the instrument is passed over the tongue and carefully forced along the gullet until the obstruction is reached, when gentle and continuous pressure is to be kept up. Violent and spasmodic movements of the instrument are

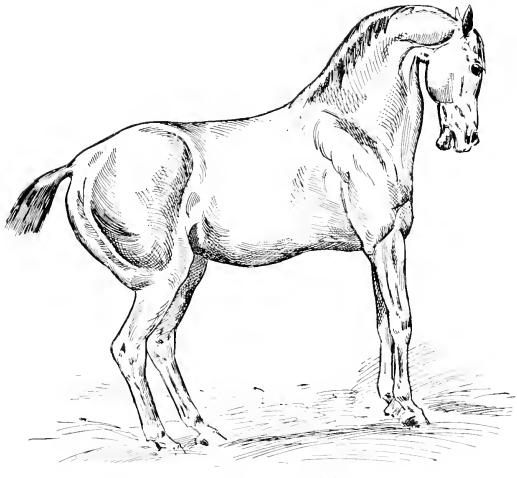


Fig. 97.—Choking in the Neck

to be strictly avoided. In some instances such a mode of procedure has resulted in fatal wounding of the gullet.

Should all these methods fail, there is nothing left to be done save to cut down on the obstruction when accessible and remove it.

Animals relieved of choking should be made to fast for twelve to twenty-four hours, a little thin gruel only being allowed during that time, and for two or three days afterwards the food should be soft or even sloppy.

VOMITING

Vomiting, or the ejection of the stomach's contents by the nostrils and mouth, is comparatively rare in the horse; so much so that many persons believe that it never occurs. In the chapter on choking we have already spoken of apparent vomiting, which was in reality only the ejection of the contents of the tube leading to the stomach. Two reasons are commonly advanced for the rarity of vomition in the horse: first, an insusceptibility to nausea; and second, a peculiar valve-like arrangement of the parts at the entrance to the stomach. The first reason is not an entirely satisfactory one, as nausea is often exhibited by horses; and the second needs more proof. Without arguing the case we will pass on to the known causes and treatment where treatment is possible.

1. Engorgement of the stomach with indigestible food, followed by fermentation, elimination of gases, and consequent distention. This has been known in several instances to be followed by repeated vomition, leaving the patient in a prostrate condition, but not always resulting in death.

2. When the œsophagus at its terminal portion has been permanently dilated—an argument in favour of the valve theory.

3. In cases of rupture of the walls of the stomach or of the diaphragm. The late Professor Robertson entertained a fourth reason, of which, however, we can have no proof—namely, the closure of the *pylorie* orifice and consequent prevention of the contents of the stomach passing out into the bowel. Post-mortem examinations have repeatedly proved that vomition may occur when any of the three first-named causes exist.

ACUTE INDIGESTION

Indigestion presents itself in one of two forms—either it is *acute* and attended with severe pain and suffering of short duration, or it assumes a less noticeable but lingering and *chronic* character.

To the horse-owner and stableman this form of the disease is better known by the terms "stomach staggers", "sleepy staggers", and "mad staggers"—expressions which, if not classical, serve at least to convey a good idea of the leading phenomena of the affection. They specially indicate the two forms of disturbance which the brain suffers as a consequence of acute stomach derangement, in the one case denoted by severe brain disturbance resulting in actual frenzy or madness, in the other by brain torpor or paralysis, with loss of consciousness and volition, and imperfect control over voluntary movement.

Causes.—Acute indigestion is recognized by veterinarians as a result of the stomach being gorged or over-crammed with food. In this affection the organ becomes unduly enlarged or distended; its walls are consequently paralysed and incapable of contracting on their contents. The food, therefore, becomes stagnant, and instead of being digested and passed on in the ordinary way, remains to decompose and further distend the organ with gas. Such a condition is in the highest degree dangerous, and frequently ends in rupture and speedy death.

Stomach engorgement or paralysis almost invariably follows upon long fasting, and especially when, in addition, the victim is worn down by

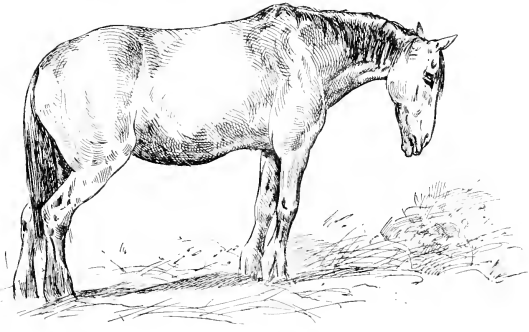


Fig. 98.—Sleepy Staggers

fatigue. In this state the stomach shares in the general depression and exhaustion, and suffers at the same time by any unreasonable demand that may be made on its powers. Horses are provoked by long fasting to eat to excess, and the mischief is considerably augmented by the imperfect chewing which the food at these times often undergoes.

The practice of allowing hungry horses an unmeasured quantity of cooked food is one not to be encouraged. Given in a small amount preliminary to the usual feed it is incapable of harm, but when supplied in large rations it not infrequently becomes a means of fatal engorgement of the stomach. This disease is also observed to follow when horses by accident gain access to certain kinds of grain, as wheat, barley, and maize.

Symptoms.—It is impossible to say at the outset of an attack of stomach engorgement what particular group of symptoms will arise in the course of the disease. This will most likely depend on the degree of

distension and the more or less complete state of paralysis to which the stomach is reduced. It may, however, be safely predicted that they will begin and end in manifestation of abdominal pain, or, from the first, disorder of the brain will appear, or the one may precede and ultimately give way to the other.

In instances of the first kind the patient ceases to feed and presents a dull heavy appearance. He is restless, moves from place to place, looks languidly round to the flank, essays to lie down, and resumes an upstanding posture without going to the ground. He paws with the fore-feet, and as the pain increases in severity exhibits an anxious expression of countenance. The body gradually enlarges as the result of fermentation going on in the stomach, and in the fits of pain he throws himself to the ground and rises again to repeat the same after varying intervals of temporary repose.

Should the disease continue, patchy sweats bedew the body, the movements become unsteady, the muscles of the limbs tremble, gas is belched up from the stomach, and in rare instances attempts at vomiting are observed, but the act is seldom accomplished save as to a little fluid matter.

Should the stomach recover its action, as it sometimes will after a free discharge of gas, these symptoms gradually subside, and nothing remains beyond the weakness resulting from the attack, which, with due care, soon passes away.

In the absence of relief rupture of the stomach and death may be apprehended.

In those cases where the brain becomes affected a different order of symptoms is developed, in some instances assuming the form of what is known as "sleepy staggers" (fig. 98), in others of "mad staggers". In the former the patient, after exhibiting signs of abdominal pain, becomes dull, heavy, and stupid. The head is carried low, the eyelids droop, the lips hang pendulous, and in this drowsy half-insensible condition the horse walks round and round the box with a slow, staggering gait in which the toes are trailed or barely lifted from the ground. After one or two turns the head is forcibly pressed against the wall or rested on the manger, and in this position he sinks into a profound sleep from which he is with difficulty awoke. On being roused the same rotary movements are repeated, and these again are followed by a deep sleep or coma as before.

Vision is much impaired and soon fails altogether, and consciousness gradually disappears. The breathing at this time is slow and attended with a stertor or snorting sound, and the pulse also is less frequent than normal. The bowels are invariably torpid, and little or no faeces are

passed. Such as may be expelled are hard and usually covered with a glairy coating of mucus. The liver in these cases frequently gives evidence of disturbance in the high-coloured urine and yellowish discoloration of the membranes of the eyes, mouth, and nostrils.

Sooner or later in the course of the attack dulness or stupor may give place to uncontrollable excitement and delirium (mad staggers). In this condition the animal paws the ground violently and plunges madly about the box. Perspiration bedews the body, and the muscles are thrown into a tremulous agitation over the entire body. Efforts at vomiting may now appear, and a small amount of offensive, sour-smelling fluid escapes from the stomach. In the absence of relief, which is seldom capable of being afforded at this stage of the disease, repeated paroxysms or violent fits of frenzy end in exhaustion, which is frequently followed by rupture of the stomach and speedy death.

Treatment.—The prospect of success in the treatment of stomach engorgement will depend in a great measure on the prompt recognition of the disease and speedy adoption of suitable curative measures.

The first and most important object is to unload the bowels and relieve the distended stomach. For this purpose a bold dose of physic is the most suitable means and should be administered at once. Food of every description must be withheld and water allowed in any amount.

Where the symptoms indicate abdominal pain a little aromatic spirit of ammonia, combined with tincture of opium and peppermint-water, may be given and repeated at intervals of two hours for two or three times. This may be supplemented by friction and fomentations to the belly. A few minutes' walking exercise at short intervals will prove beneficial, but the animal must not be hurried. The rectum should be emptied of excrement by means of the hand, after which enemas of salt and water may be thrown into the bowel every three or four hours. On the appearance of brain disturbance a little blood taken from the jugular vein will afford relief to the cerebral vessels, and arrest the progress of the disease as it affects the head.

Ice-bags to the poll, or a cold-water douche kept up for fifteen minutes at a time, will further assist. If the latter course be adopted, cold wet swabs should be applied to the head in the intervals between the douching.

CHRONIC INDIGESTION

Causes.—This form of the disease may have its origin in a variety of causes. Some of these refer to faults or weaknesses in the animal itself; others are connected with feeding and management. In regard to the

former, we recognize functional and organic disease of the stomach, bowels, and liver; while in respect of the latter, we notice it to result from sudden changes of environment, excessive labour, want of exercise, irregular feeding and watering, hard water, bad food, imperfect mastication either from greediness or defective teeth, excessive numbers of parasites, the habitual use of artificial foods, and the abuse of drugs.

Symptoms.—Loss of condition is in constant evidence in this disease, manifested in leanness, an unthrifty coat, hidebound, and dry skin. The appetite is variable, at one time ravenous and at another indifferent or altogether absent. Licking the walls of the stable, grinding the teeth, an occasional cough, crib-biting or wind-sucking also mark the presence of chronic indigestion. When of long standing, it has been observed that the hoofs become brittle and shelly in consequence of the well-recognized sympathy that exists between the mucous membranes of the digestive canal and the horn-secreting structures of the feet. The excrement emits an unpleasant odour. Constipation is a more frequent symptom than diarrhœa, but a looseness of the bowels is a common accompaniment of the disorder with horses of that particular conformation known as "washy". A distended abdomen, and the occurrence of brief attacks of abdominal pain, are symptoms that sometimes attract the owner's attention, though he may have failed to attach special importance to them.

Treatment.—Before attempting remedial measures, a searching inquiry should be instituted into every detail of the animal's feeding, watering, exercise, and management; the food being examined and the water subjected to the ordinary inspection, and, if need be, analysis. The mouth and teeth should receive special attention, as the whole difficulty may arise out of some disease or disorder in them which renders mastication imperfect. The character of the fæces and urine should be noted, not once or twice, but daily. The former may contain parasites; it may be abnormally pale, indicating impairment of the liver, or it may be coated with mucous, indicating derangement of the bowels. Although after the most exhaustive examination and inquiry the cause may not be discovered, yet the symptoms may be ameliorated by a careful regimen, and assistance afforded by the administration of some of those digestive tonics which experience has proved to be so valuable.

Though the food hitherto supplied to a subject of chronic indigestion may be sound, and in every way suitable to another horse, change to some other forage may be followed by early and marked improvement. In the case of town-kept horses, long strangers to grass, the cause is often an inactive liver, and a turn out at pasture is found to be the best remedy; but a compromise may be effected in most large towns by the employment

of green meat, beginning with the first cut of rye-grass in April, and ending with vetches in August, or as soon as the seed-pods become developed.

An animal that has been once the subject of chronic indigestion should never be supplied with oats kiln-dried, or indifferently-harvested or doubtful hay; and the so-called "mixtures" which often contain Indian vetches, or "peas" as they are termed by dealers, should not be admitted into the stable.

The want of water has been often proved to be a cause of indigestion, as some horses will only take a very small quantity at a time, and the groom who offers it regularly in a pail does not suspect the fact that a horse is not getting enough. The objections to having water always beside a horse must be made to give way in individual cases, as animals known to be "sippers" will do well if allowed to drink in their own way, *i.e.* small quantities at frequent intervals, while allowing the bucket to pass them after taking a wholly inadequate quantity.

An occasional aperient is found to be beneficial with some animals, and as a preliminary measure in the constipated, an aloetic or physic-ball may be tried. In animals disposed to distension of the belly a small dose of linseed-oil occasionally is recommended, and salt with the food in regular quantities daily will prove beneficial. Calumba or gentian-root powder, combined with bicarbonate of soda, is also found valuable where flatulence exists and the appetite is indifferent. Iron in its various forms is not advisable in those cases where constipation is a prominent symptom, but it is a valuable adjunct to the vegetable bitters above named for those subjects of chronic indigestion with a tendency to looseness of the bowels. The detection of worms in the excrement will, of course, point to the use of worm medicines before entering upon general treatment intended to combat the condition brought about by their presence. In addition to a suitable diet and medicinal agents, the work or exercise should be made as regular in amount as possible, and its effect noted. If the horse too easily perspires, it may be concluded that he is doing more than is likely to benefit him. Removal of a heavy winter coat will sometimes prove helpful, while clothing and bandaging and plenty of friction to the skin are recommended.

GASTRITIS

Definition.—Inflammation of the mucous membrane of the stomach, especially involving the more highly vascular or villous portion contiguous with the intestine. It differs from mere gastric irritation or functional

disturbance both in its severity and in the structural changes which result from it. It may be acute or chronic.

ACUTE GASTRITIS

Causes.—Acute gastritis is not uncommonly associated with engorgement of the stomach, and may result from the presence of a foreign body, or from the action of irritant poison on the lining membrane. It is also shown to arise sometimes in the course of one or another of the contagious fevers. Of the irritant poisons inducing gastritis in a horse, only a few are likely to be taken voluntarily in the food, or from a spirit of mischief or curiosity, or to be given out of ignorance or malice by attendants. These are the salts of copper, zinc, mercury, lead, and arsenic; the last named being the most frequently met with, as it is easily obtained in large quantities in the form of sheep "dips" despite the arsenic acts and pharmacy laws, which afford altogether insufficient protection to the stock-owner. Of the poisonous plants, the leaves and shoots of the yew and rhododendron are not uncommonly the cause of gastritis.

Symptoms.—In this disease acute abdominal pain continues without intermission, and there is but slight diminution of intensity save for short periods. The pulse is small and hard, the breathing quickened, and the expression anxious and miserable. The mucous membranes of the eyes and nose are intensely reddened, profuse sweats break out, and the animal looks back towards the flank. These symptoms are common to gastritis from any cause, but there are certain others special to inflammation of the stomach when induced by irritant poisons. In the case of arsenic, the most common are intense thirst and frothing at the mouth. The lips are sometimes swollen and pendulous; there is restlessness and excitement, hurried breathing, and a small and maybe imperceptible pulse. The muscles quiver, and the body is suffused in sweat, and the breath gives out a fœtid odour. Paroxysms of pain recur again and again, and death follows in great agony.

When the disease is dependent upon yew poisoning it is usually associated with great nervous prostration and collapse, and a fatal termination quickly follows the ingestion of the poison.

Treatment.—To arrive at the cause, if possible, should be our first care, as upon this the treatment will greatly depend. If it is found to result from engorgement of the stomach, or from irritation of foreign bodies swallowed with the food, treatment will consist in the administration of soothing and demulcent remedies, as linseed-tea, barley-water, or milk, together with a mixture of powdered gum-arabic, bismuth, and hydrocyanic

acid; the latter are particularly effective in some cases; and if the acute symptoms abate, a long and careful regime must be observed before a stomach thus injured can take upon itself the digestion of ordinary foods, as hard corn and hay. A gradual upward scale of dietary, from linseed-tea and slops, bread, meal, carrots, mashes, and green meat, may lead to a moderate allowance of steeped or scalded corn, and finally oats and hay.

When an irritant poison has been taken and its nature has become known, direct antidotes should first be administered. A list of these will be found in a subsequent chapter, where the individual in search of a remedy has been supplied with information for his guidance until the services of a qualified veterinary surgeon can be procured; and as cases of this description require special care and treatment, no time should be lost in securing veterinary aid, while such antidotes as are at hand may be profitably administered pending his arrival. Eggs, with linseed-oil and gruel, may be beaten up and given in the interval of waiting, or in the absence of these, milk, linseed-tea, or a solution of gum-arabic.

The rarity of vomition in the horse, elsewhere referred to, and the all but impossibility of exciting it artificially, deny us one of the chief aids available to the human surgeon, who will hasten to empty the stomach of any remaining poison either by means of an emetic or the stomach-pump. In the case of the horse, however, we are compelled to rely on the action of chemical antidotes to neutralize the poison, and on physiological agents to control its action.

Abdominal pain, which is a leading feature of the affection, should be met by the employment of hot compresses over the region of the stomach —blankets or sheets dipped in hot water (the naked elbow should be the test of temperature) and covered with waterproofs, as loin cloths, to retain the moisture and keep the parts continuously steamed. The intestinal track must be cleansed of the pernicious matter, but not by any heroic remedies; small doses of oil, linseed or castor oil, emulsified by whipping with mucilage, will answer the purpose.

CHRONIC GASTRITIS

Chronic gastritis is more frequently met with than the condition previously described. It may follow upon the acute form as a sequel to irritant poisoning or engorgement, or arise out of a long-continued course of improper feeding. Horses passing from the hands of dealers and exhibitors who have forced them to a state of obesity by the employment of cooked food are specially liable to gastric disturbance of an abiding

nature when suddenly placed on hard, dry food. Again, coarse, innutritious food, such as is furnished by poor hill pastures, consisting of scrub and the coarser kinds of vegetation, after regular, perhaps liberal diet in the stable, is often the determining cause of the disease. The habitual use of drugs may also lay a foundation for chronic gastritis.

Symptoms are for the most part those of indigestion. Failure on the part of the stomach to perform its share in the process of digestion results in functional derangement of the bowels, which may declare itself in periodical attacks of colic or more or less pronounced diarrhœa, wasting, and weakness. The appetite is variable, and sometimes the animal refuses food altogether.

Treatment.—If the cause can be ascertained much may be done, but, where it remains obscure, treatment can only be tentative and expectant. Where dietetic errors can be distinctly traced, a complete change of food, or the system of feeding, will often result in speedy amelioration and ultimate restoration of the gastric function. A comparative rest to the stomach may be afforded by giving a light and well-selected diet, including milk, well-boiled gruel, and other things requiring little work from the affected organ. This may be supplemented by antacids in the drinking-water, and the administration of gastric sedatives, as bismuth, hydrocyanic acid, and pepsine, as an aid to digestion. When sufficient progress has been made towards convalescence, more solid foods, as crushed oats, scalded bran, and linseed, may be given, with a few roots.

CHRONIC DILATION OF THE STOMACH

Dilation of the stomach may arise either from physical or physiological causes. In the former case it results from the slow growth of malignant and other formations in or around the pyloric opening by which the food is prevented from escaping into the small intestines. In the latter—the more common form of the affection—it appears more especially in old animals who have led a life of indolence and high living, and are then cast away to subsist on large quantities of coarse indigestible food. Under these circumstances the mucous membrane becomes atrophied, pale in colour, and more or less disorganized, while the muscular coat is thin and greatly stretched, so that the organ is two or more times larger than it should be. Chronic dilation of the stomach and of the intestines also is sometimes seen in old broken-winded animals.

Symptoms.—These partake of the character of indigestion, with more or less rapid wasting. At first the appetite falls away, the skin becomes staring and dirty, the belly increases in size, the bowels are irregular—at one time constipated, at another relaxed, always distended with flatus.

When the disease has its origin in some obstructive disease, severe attacks of colic appear from time to time after feeding, during which the stomach may rupture in the violence of the struggles.

In this disease treatment is of little avail. In the majority of cases it is an evidence of general decay, and where it arises from causes which obstruct the passage into the bowels, as from tumours in and about the pylorus, there is little to be hoped for.

RUPTURED STOMACH

Ruptured stomach is rarely met with in young horses except as a result of extraordinary violence when the stomach has been greatly dis-

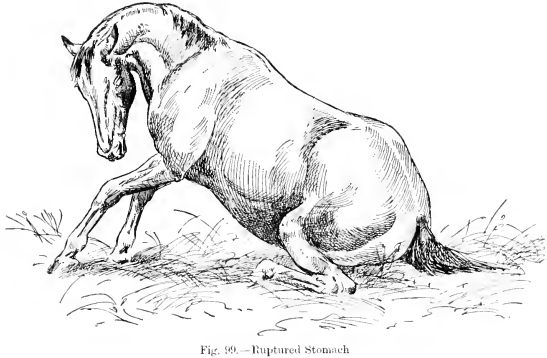


Fig. 99.—Ruptured Stomach

tended by food. In many cases the mishap is preceded by structural changes inducing dilatation and weakness of the walls. These may have resulted from a former gastritis, acute or chronic, or from habitual distension in overfeeding, or from the protracted use of bulky and innutritious food, as is so often the case with farm-horses fed upon indifferent provender and other unsaleable products of the farm. Severe work on a full stomach is not rarely responsible for this disease. Heavy draught-horses are the more frequent subjects of this lesion, though it may, and does, occur in horses of all classes. The work of the draught-horse is not so well-regulated as that of the lighter breeds, nor is his attendant, as a rule, as judicious a feeder as that of the hackney or hunter.

Symptoms.—A correct diagnosis of this lesion during life is seldom possible, even to the most experienced practitioners, as many of the symptoms resulting from the accident are common to rupture of other important parts of the alimentary canal. Although vomition is often a leading symptom, it is too frequently absent to be regarded as a reliable indication of the disease. Experts are not in agreement as to whether rupture of the stomach precedes or follows the act of vomition. While some are of opinion that vomition does not occur while the viscus is intact, others hold that a stomach, rent and permitting its contents to escape into the abdomen, would not be capable of exercising that forcible contraction which precedes the ejection of its contents in an upward direction. When rupture of the stomach occurs as a sequel to engorgement, there are the usual manifestations of acute abdominal pain, such as pawing and stamping, getting up and lying down, rolling, looking round at the flank, &c. (fig. 99). These are soon followed by less active symptoms, when the patient stands with haggard and anxious countenance: the breathing becomes shallow, the extremities cold, the visible mucous membrane blanched, and the pulse fluttering and feeble. There is now a general appearance of impending dissolution, which those familiar with animals may recognize readily if not describe. The temperature, which may have run up quickly, now falls, and with it comes a trembling, tottering gait, sighing, and perhaps sweating. In this stage of the disease the animal soon collapses, but remains on his feet till he falls dead, or dies after a few convulsive struggles.

COLIC OR GRIPES

There are two kinds of colic, distinguished as spasmodic colic and flatulent colic, both of which are characterized by symptoms of abdominal pain. Spasmodic colic results from morbid contraction or spasm of the muscular structure of the bowel, while flatulent colic arises out of the opposite condition, by an over-distension—or outward stretching—of the gut with gases evolved from the fermenting or decomposing food. Although the symptoms are pretty familiar to horsemen, very vague notions are usually held as to the seat of pain. Stablemen are wont to declare the horse's water is wrong, and they therefore attach undue importance to the act of urination, and in this mistaken view administer agents altogether unsuited to the requirements of the case.

Causes.—The disease has for its origin a variety of causes. Indigestion is accountable for more cases than any other cause, and, as we have already seen, assumes a variety of forms.

Drinking copiously of cold water on an empty stomach when exhausted by prolonged exertion is another cause. Some springs of water are specially prone to produce gripes, and are avoided by horse-owners for that reason. The presence of parasites when in large numbers, and the existence of calculi (stones) and other concretions, are fruitful causes of the malady. It also results from the lodgment of foreign bodies in the bowels, and chronic disease of the latter is sometimes its cause.

Symptoms.—These are usually very sudden in their onset. All at once the horse is seized with pain, which he evinces by pawing and scraping

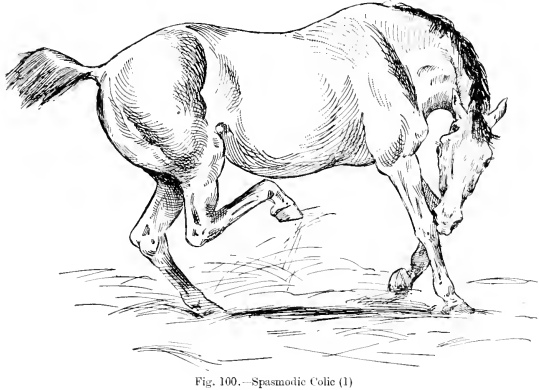


Fig. 100.—Spasmodic Colic (1)

the ground with his front feet, stamping and striking the belly with the hind ones, lays back his ears and looks round to his flank. From time to time he shows a desire to lie down, crouching as if to do so, and again raising himself to the upright position. He may repeat these movements several times, and then go down almost recklessly, perhaps to rise immediately or roll over from side to side in a violent manner. True or spasmodic colic is intermittent, and in the midst of his sufferings the patient may get up, shake himself, and begin to feed as if nothing ailed him. This, however, only marks a brief respite as a rule, for the symptoms will again return, and often with increased violence, when the animal will wander round the box and throw himself violently down in the fits of pain. Examination of the fæces generally prove them to be small in amount, hard, and not unfrequently coated with glairy mucus. It may also be that

different portions will vary in consistence, traceable to a sudden change from soft to hard food or the reverse.

The quickened pulse and breathing observed during the paroxysms of suffering pass away when the pain has subsided, and in the intervals show little or no disturbance.

In favourable cases the intermissions of pain are prolonged in duration and the symptoms less acute. If, however, the severity of the attack increases and the intervals of ease become shorter, it portends danger.

Treatment.—The timely administration of a diffusible stimulant is often sufficient to relieve a passing spasm, but it is more to the point in

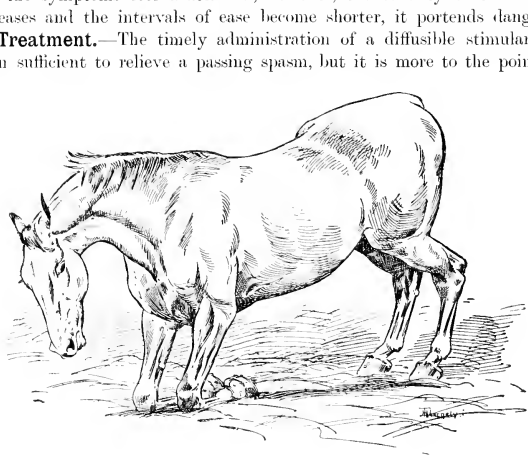


Fig. 101.—Spasmodic Colic (2)

these cases to administer a ball of aloes without loss of time. This will have the effect of keeping down the tendency to inflammation and remove offending matter from the bowels. Opium in various forms, as ammoniated tincture of laudanum alone, or in combination with ether or aromatic spirit of ammonia, are most useful in subduing pain and controlling spasm. The repeated administration of opium has the effect of retarding the action of the bowels, however, and many horses have been lost from the want of an aperient to counteract it. This the aloes ball does from the first, enabling us to give bolder doses and to continue them over a longer time. Where drenching is undesirable, morphia or belladonna may be injected beneath the skin by means of a suitable syringe. Used in this manner, morphia is said to have all the good effects of opium without its objections.

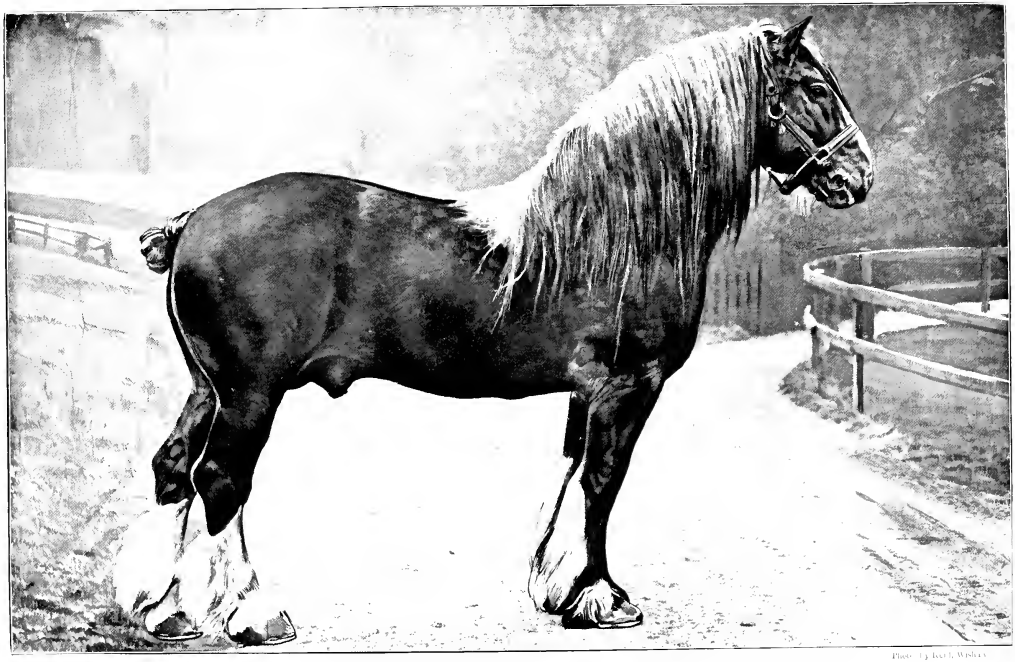


Photo. by Beers, Wisbech

PLATE XXV.

CLYDESDALE STALLION: LORD STEWART

By Castlereagh 10324; dam, Lady Susan 11442 by Callender 4301. The Property of Seaham Harbour Stud Company

In an emergency, where, as sometimes happens, drugs are not to be obtained, gin or whisky with a little ginger form a useful draught with warm or cold water. Like the other diffusible stimulants referred to, they serve to distribute the nerve force, which for the time is acting prejudicially on a portion of the bowel, producing spasmodic contraction. An early opportunity should be taken in these cases to empty the posterior bowel of its fæcal contents by passing the hand up the rectum. This should be followed by the introduction of clysters, composed of water at about the temperature of the body in which a little soap has been dissolved. A considerable amount of relief may be afforded by repeating the injections at

Fig. 102.—Spasmodic Colic (3). (Horse rolling in pain.)

intervals of an hour or two, in course of which the action of the bowels may be materially expedited if a little sulphate of magnesia or linseed-oil be added to the soap solution. Stimulation of the abdomen from the outside by means of friction, with wisps of straw or liniments, or rugs dipped in hot water, should not be overlooked. Violent rolling is to be guarded against as much as possible, and some advantage may be derived from short spells of walking exercise, which will assist in promoting the action of the bowels.

FLATULENT COLIC

Definition.—This is a condition in which the large bowels are distended with gas brought about as a result of decomposition of the food contained in them. It may follow upon spasmodic colic, or result from some other condition by which the passage of food along the bowel is retarded or arrested.

Causes.—Among these are food of an improper nature, eating too fast and too much after long abstinence. It is also a result of intestinal obstruction, imperfect mastication arising out of irregularity of the teeth, and of altered structure and disordered function of one or another of the organs of digestion. Potatoes, rapidly-grown clover, and succulent grasses taken after a long fast will also induce it. To know which of these causes is in operation is important, as upon it will depend the course of treatment to be pursued.

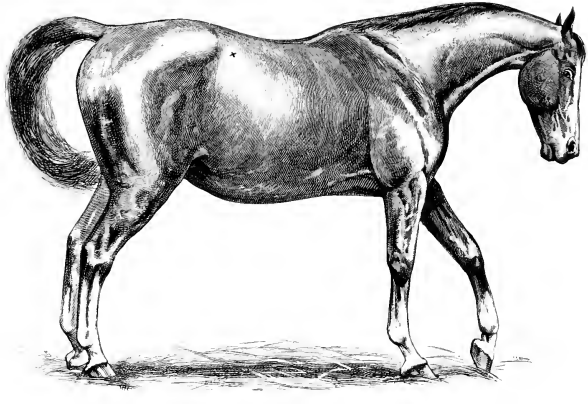


Fig. 103.—Flatulent Colic. The × indicates the point where the trochar is introduced

Symptoms.—The most striking and characteristic symptom is the drum-like distension of the belly (fig. 103). The manifestations of pain are not so sudden and acute as in spasmodic colic, but come on gradually; moreover, the pain is continuous, and attended with more danger than in spasmodic colic. Abdominal pain is evinced by restlessness and pawing, looking round at the flank, distressful countenance, and it may precede or follow the drum-like condition of the belly. It must, however, be remembered that individuals vary very much in their behaviour when suffering from this form of indigestion. To the violence of some patients may be attributed such fatal consequences as rupture of the intestine, while others show great depression of spirits, standing with a pained and anxious look, or wandering fitfully about the box, fearing to lie down, and, when compelled by pain to seek a change of posture, getting down slowly and

carefully, and stretching out upon the side at full length, with only occasional wistful looks backwards. This attitude gives an even greater appearance of tympany than when the animal is standing, but the pressure on the under side of the body would appear to assist the patient in breaking off wind. The pressure of the distended bowels in a forward direction, and the pain experienced, cause the breathing to be quickened and shallow, and the pulse frequent and diminished in force. The duration of this disease is variable and uncertain. In some animals relief is speedily obtained by voluminous discharge of wind per rectum, without medicinal or other agents; in others it may last for many hours, and as long as two or three days. When flatulent colic has been caused by succulent food, as green clover or lucerne, its duration will probably be shorter than in a case where an animal has eaten excessively of meal or grain or other food requiring greater digestion.

Treatment.—To break up or disperse the gases is the primary object of treatment, and a great many drugs have been credited with these powers. Hand-rubbing and wisping the abdomen appears to be agreeable to the patient, and probably affords some relief. Walking the animal about conduces also to breaking wind. The most rapid and effectual method of giving relief is to insert a suitable instrument into the right flank, and by tapping the distended bowel give exit to the confined gas. This operation has not hitherto been resorted to as frequently as it should have been, owing to what now appears to be an unfounded fear of inducing peritonitis. The insertion of the instrument and the withdrawal of the trochar is followed by a free escape of gas and the rapid subsidence of the distended belly. A marked diminution of pain and a more cheerful expression on the part of the patient are also produced. Owing, however, to the supposed danger of the operation it is frequently postponed until the patient is *in extremis*.

The medicinal agents to be chosen are those which will chemically decompose the gas, arrest further fermentation, and carry away the offending ingesta. It must also be our endeavour to restore the power of contractility to the overstretched and weakened walls of the implicated bowel.

Of the first class, aromatic spirit of ammonia and the carbonate of ammonia have the best reputation. Linseed or other bland oil, as olive or cotton-seed oils, appear to disperse or arrest the further elimination of gas, and by their laxative qualities assist in removal of the offending solids.

Carbolic acid and the emulsions of creasote, very largely diluted, and weak preparations of chlorine, such as may be produced by agitation of a dram of chlorinated lime with a pint of water, arrest decomposition; while

such stimulants and carminatives as turpentine and spirit of nitrous ether, capsicums, cardamoms, ginger, and the fruits of the pepper tribe generally, are calculated to restore tone to the affected parts. A draught consisting of laudanum, spirit of nitrous ether, and linseed-oil has for long enjoyed a good reputation, and is usually to be found in most large studs. Some relief may be afforded by promptly unloading the rectum of its contents with the oiled hand and afterwards throwing up a clyster, which may be repeated every three or four hours.

A fatal result is sometimes precipitated by rupture of the distended bowel or of the diaphragm by reason of the continued outward pressure on the gut. With abatement of the symptoms abstinence for some hours should be insisted upon, and small quantities only of food allowed until restoration appears to be complete.

CONSTIPATION

Definition.—Constipation is a condition of the intestines in which for various reasons the fæces are too long retained, too hard in consistence, and voided with difficulty in inadequate quantity.

Causes.—The causes of this disorder are many and various, the more common being continued feeding upon dry provender, insufficient and irregular watering, woody and innutritious foods, as in the case of forest ponies subsisting on heather, moss, and twigs of trees and bushes in dry seasons. In addition, it is also induced by sudden changes of diet, want of exercise, mechanical obstructions, debility, and imperfect secretion of bile and other digestive juices. In very young foals it is often due to plugging of the rectum with meconium which has accumulated in the bowels during the latter part of fetal life.

Symptoms.—It is only in the most pronounced cases that attention is drawn to this ailment—when it is noticed that the fæces are discharged with difficulty, and after considerable straining, during which the back is arched and the hind legs are brought under the body, the act of defecation is completed with a groan. The dung is voided in small quantities, consisting of hard round pieces more or less glazed and dark in colour.

It is a common affection of very young foals, and the experienced breeder or attendant, whose observation has been cultivated, will suspect this condition if the new-born foal at frequent short intervals is found to posture as if to pass urine; he may not arch his back in the manner of an adult, but will evince signs of uneasiness, elevating the tail, straining, looking back, lying down at full length and rising again as if suffering abdominal pain.

Treatment.—Since a variety of causes contribute to induce constipation, they should be fully considered before deciding upon treatment, as the aloetic ball, which may answer well for adults with a sluggish liver, may be quite unsuitable for other subjects. For the young foal, where the rectum is plugged with a hard yellow substance, an oiled finger may be introduced and the obstruction removed, with a careful avoidance of injury to the lining membrane of the bowel by the operator's nails. A simple enema of soap and warm water, or glycerine, or the introduction of lard or vaseline, is usually all that is required, as with each day the intestine is developing greater powers, and the expulsive efforts are soon found to be sufficient to relieve the loaded bowel of its contents. If constipation continues, a small dose of castor-oil may be given, preferably in warm milk; and if the dam is not at grass she should be supplied with a laxative diet, which, acting upon her, will soon be found to influence the colt favourably. Some breeders, more careful than the average farmer, give in-foal mares bran and middlings and pulped roots for a few days before foaling, a practice in favour of which something can be said, both as a milk-producer and for the special purpose to which we have alluded.

Constipation in the stabled horse should be guarded against by the bran mash or linseed prescribed by good horsekeepers, and an animal predisposed to hardness of the fæces should be allowed an extra laxative diet, rather than given drugs. Green meat made into chaff with hay or straw, during the summer months, will serve the purpose of keeping open the bowels in costive subjects, who would perhaps eat only the green food if offered separately.

An aloetic ball, proportioned to the size and breed of the animal, may be given where an early evacuation of the bowel is imperative, but as a rule the repetition of small laxative doses of linseed-oil, or sulphate of magnesia, is preferable to the administration of one drastic purgative, which is apt to be followed by inaction of the over-stimulated intestines.

When debility has been a contributory cause of constipation it may be necessary to give tonic agents and a more liberal diet, but if iron be one of the agents selected there is a risk of further constipation, unless corrected by more laxative foods. Nux vomica, in small doses, continued over a considerable period, may prove one of the most valuable remedies in restoring functional power to the muscular walls of the bowels.

As feeding errors are the chief cause, so will the remedy be found in a more suitable dietary, and each animal should be fed according to his requirements. The practical horseman need hardly be reminded that horses differ so much in the effect of food upon the alimentary

tract that the peculiarities of each should be carefully noted and treated accordingly, instead of insisting upon any hard-and-fast rules regulated by market prices or local prejudice.

DIARRHŒA

Definition.—Diarrhœa is the expression of an irritable condition of the alimentary canal, sometimes resulting from an excess, or deficiency or impaired quality of one or other of the digestive secretions. It is marked by an increase in the quantity and fluidity of the alvine discharges, and is accompanied by digestive disturbance, and occasionally by inflammatory changes involving the stomach and bowels.

Causes.—The causes that give rise to diarrhœa are improper food, sudden changes from one kind to another, gluttony, eating too fast after long abstinence, imperfect mastication, bad water, chills, overwork, and exposure to vicissitudes of climate. It may also be induced by parasites, chemical irritants, and injudicious drugging, or perverted function of the liver and other organs. Besides these, excessive action of the bowels may be caused by an effort of nature to rid the system of some deleterious agent in the blood. This is not unfrequently seen in advanced lung disease, or where the function of skin or kidney is arrested and impurities which they should discharge are allowed to accumulate in the system. When associated with other diseases, and as a sequel to inflammatory and wasting disorders, it is a grave condition, and may be the prelude to dissolution; the conditions which bring about like results in the young have often a very different origin and more frequently fatal consequences. In some seasons and in particular situations a mucous catarrh, extending from the mouth to the anus, and especially involving the bowels in certain portions, is sometimes prevalent among foals. Its cause in the majority of instances is some alteration in the character of the milk, or functional derangement of the mare, consequent upon unsuitable food, or it may be a sequel of difficult labour, or parturition troubles. Anything interfering with the well-being of the dam is liable to be reflected in the health of the sucker. A very large proportion of the cases of diarrhœa met with in young foals are to be accounted for by long abstinence while the mares are at work, and the overheating and excessive exertion to which the latter are subjected at a time when nature is making a special demand on the system in the supply of milk. Maternal solicitude under certain circumstances renders mares restless and excitable, and takes more out of them than the work assigned would do at any other time. Without discussing here the propriety or

otherwise of working mares while suckling, we may remind readers unacquainted with the details of farming, that foals arrive at a time of the year when the majority of agriculturists have much need of the mare's services, and economic considerations demand that notwithstanding her maternal duties she must contribute to the general work of the farm. The practice of hand-milking the dam on return from work while she is allowed to fondle her foal over a gate till their mutual excitement has subsided, would appear to reduce the liability to derangement of the foal to some extent, and no serious objection can be made to it; the foal will get a sufficient supply after the more objectionable portion has been drawn off, and possibly that portion which would have proved deleterious. Diarrhœa may be present in the first few days of the colt's life, the milk apparently disagreeing with him from the first—those sucking a foster-mother are sometimes upset by their first meal, especially if it happens that the orphan has been put to a mare whose foal was born some time prior to the birth of her adopted one. Here the lacteal secretion is altogether devoid of those aperient properties belonging to the milk of a mare which has recently given birth to a foal, and is consequently less suited to it at this early period of its life.

Symptoms.—Diarrhœa is characterized by frequent fluid evacuations; where these are not actually seen the existence of the malady may be gathered from the dirt and stains on the thighs and lower portions of the limbs.

In the stabled horse the premonitory rumblings of the bowels and uneasiness usually escape attention, or they may only occur when the horse is called upon to exert himself. Some "washy" horses, whose feeces are pultaceous or normal in the stable, begin to unload the bowel as soon as the harness or saddle is taken down, and more or less diarrhœa is the result of every journey undertaken. This is unmistakably due to nervous excitability acting upon a susceptible digestive system; and a troublesome condition it is to deal with, since too much work may induce exhaustion and loss of condition, while too little will add to the excitement on each occasion of exercise. In all cases of diarrhœa the ejected material should be examined, when the active cause of the disease may be discovered. If it be woody fibre, it will be found in the liquid matter, or occasional agglomerations of hardened fæcal masses of irregular shape will be observed. When a diet of potatoes has induced purging, a very offensive odour accompanies the evacuations, and the mouth is sour and saliva tenacious, while a tendency to abdominal pain may be noted in pawing and crouching as in colic, nausea, and an expression of lassitude and dejection, with a weakened pulse and inappetence, following upon the ordinary symptoms.

In diarrhœa arising from intrinsic causes, general inquiry into the previous health of the animal, or the presence of excessive quantities of biliary matter in the stools, or the discovery of parasites in great numbers, &c., may be of use in directing the prescriber. In the case of the sucking colt with the first fluid evacuations there will probably be no general signs of illness, but with its continuation he loses his appetite for play, and then for milk, stretches himself at full length on the ground and remains prone for a long time, and at intervals looks round at his flank, raising his head from the ground and allowing it to fall back again with an appearance of extreme languor. Abdominal pain of a more acute kind supervening, he will get up and strike at his abdomen with the hind feet, stand with all four feet close together, frequently evacuating offensive yellow fæces, which after a time escape almost involuntarily, staining the thighs, and if he is confined to a building, the atmosphere is soon rendered sour and unwholesome. If the mare and foal are at grass and in deep pasture, the character of the evacuations may escape the notice of the attendant, and not until the foal becomes tucked up in the flank, or dull and listless, does he discover anything amiss. Foals have not so great a power of resistance to diarrhœa as calves, but succumb often in a very few days, with or without inflammation supervening.

Treatment.—When affecting adults, or other than sucking colts, a consideration of the cause will determine the measures to be adopted, which in different cases may be of an almost opposite character, requiring in some the use of aperients or gentle laxatives, while astringents may be called for in others. The chilled animal, having suffered from exposure to inclement weather, will be removed to suitable environment, efforts being made to restore the general circulation with stimulants and friction, as hand-rubbing the limbs, pulling the ears, bandaging, clothing, and the provision of a dry bed; such improved circumstances may alone be found to have reduced the severity of the symptoms without the administration of drugs. The determination of blood to the central organs, which induced diarrhœa, having given place to its proper distribution, as evidenced by increased warmth of the surface and extremities, amelioration of the symptoms will follow in due course. Too early recourse to powerful astringents may lead to an opposite condition, diarrhœa being often a natural method of relieving the body of some deleterious material, and we should be content with astringent foods, as arrow-root and wheaten-flour gruel, with the addition of a little brandy if the pulse continues weak and the extremities cold. Where diarrhœa is traceable to fermented food of a hard and indigestible nature, it may be

advisable to assist its removal with oleaginous fluids, as a dose of castor-oil in warm milk, or linseed-tea, or the distinctly acid nature of the evacuations may point to the use of alkaline bicarbonates as a preparatory measure. Abdominal pain will need to be combated with opium, and cordial carminatives, as cassia, and cinnamon, and ginger, with such diffusible stimulants as nitrous ether, which may be given in gruel. The necessity for giving some fluid food consists in the irritable surface upon which it will have contact, and as soon as there is good reason to hope that the irritability has subsided a return to dry food is advised, as the majority of horses will continue to be loose in the bowels while confined to a diet of slops. As an intermediate diet between gruel and hard food we may use steeped barley and scalded oats, or oatmeal, with milk and eggs well whipped. A mixture of chalk and laudanum suspended in gum and peppermint-water is an old and efficacious remedy, much used for the young. In the treatment of sucking colts it will usually be advisable to give a moderate dose of castor-oil before administering any of the ordinary diarrhœa mixtures. Bismuth, either as a powder or added to the chalk-and-opium mixture, is much favoured in cases of some duration. Lime-water, or bicarbonate of soda in the drinking-water of the mare, will often materially affect the milk and allay intestinal irritation in the foal.

SUPERPURGATION

Definition.—This term is used to describe an artificially-induced diarrhœa by the injudicious use of purgative medicines.

Causes.—The administration of a dose of purgative medicine too large for the patient, or its repetition in too short a time. It often happens that an aloetic ball is given without due preparation, and failing to have the desired effect within the usual time, the inexperienced attendant repeats the dose, with the result that the bowels are unduly excited. Drinking a great quantity of cold water when the ball has been given on an empty stomach, or calling upon the patient for too much exertion before the purgative has ceased to act, will also induce it in some susceptible animals. Calomel, even in small doses, will sometimes provoke superpurgation when given during an attack of influenza fever, as is sometimes done where bilious complications arise.

Symptoms.—Frequent and excessive evacuation of the fluid contents of the bowels, loss of appetite, cold extremities, weak pulse, and in severe cases, in which there is considerable danger to life, the eyes assume a glassy appearance, and the odour of the breath and that of the evacuations become very offensive. There is great prostration and weak-

ness; and pain and straining, more or less severe, appear in the course of the attack. Purging may cease on account of loss of power in the gut, or in consequence of a complete emptying of the bowel. With an abatement of the symptoms, laminitis, or "fever in the feet", supervenes in some cases, and adds to the existing trouble.

Treatment.—The surface warmth should receive immediate attention, hand-rubbing the legs, pulling the ears, bandaging and clothing with warm rugs; perfect quiet should be maintained, and if necessary the animal should be removed to a box away from the others. A gill of brandy, with an egg and a pint of milk, beaten up together, may be all that is needed in slight cases; but if abdominal pain follows, and the patient gets worse, astringent and anodyne medicines should be given, together with stimulants. Ounce doses of chlorodyne, with eggs and milk, or two ounces of laudanum with a wine-glass or two of brandy, may be tried, and repeated in two or three hours. Arrow-root, boiled rice, or corn-flour may be given in frequent doses, together with eggs and brandy, or spirit of nitrous ether. Treatment would be more successful but for the injudicious use of linseed and boiled roots, which would seem to be a common stable practice in some districts. In this disorder food may be dispensed with, excepting such as is described above; the sensitive bowels need rest, and the absence of all forms of irritation is imperatively indicated. When the abdomen assumes a drum-like condition, a wine-glass of spirit of turpentine may be given with milk, or an ounce of aromatic spirits of ammonia with peppermint.

Much care is necessary in bringing an overpurged horse back to his regular diet, if that be a strong one; he should be allowed only half-rations for some days, avoiding new, or any, hay or corn the least damaged. It is important, too, that the food be given in small quantities and often. Exercise will not be necessary beyond that to be obtained in a large loose-box.

DYSENTERY

Definition.—Dysentery is a destructive inflammatory disease resulting in ulceration of the lining membrane of the bowel. It is attended with more or less hæmorrhage and a copious discharge of mucus with the faeces. It differs from diarrhœa not merely in the frequency of the discharges and in their character, but also the constitutional disturbance associated with it. It has not been satisfactorily traced to the introduction of specific disease germs nor are there any decided proofs of its greater frequency in insanitary surroundings:—more often is it attributed to causes of an

exhausting character, as bad and insufficient food, and exposure to weather without preparation, and it may also arise as a sequel to diarrhœa and as the result of some poisonous matter in the blood. The presence of parasites in unusual numbers, and drinking-water in which decaying animal matter is present, are said also to be exciting causes.

Symptoms.—In some cases profuse evacuations of a fluid consistence mark the onset of the disease, others may exhibit preliminary fever and excessive prostration. Elevation of temperature and rigors may be observed in the commencement, or be continuous in the course of the disease, accompanied by a small and irritable pulse. Abdominal pain

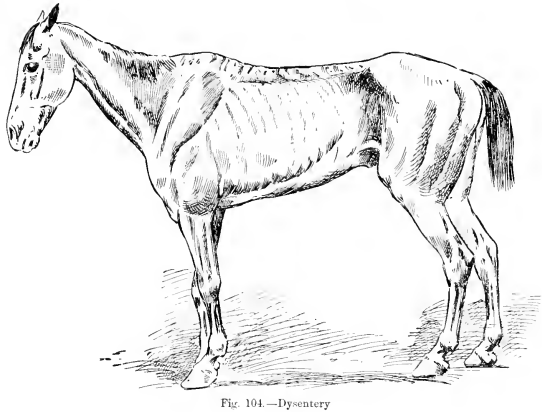


Fig. 104.—Dysentery

prior to, or immediately following on the evacuation of fæces, is a common symptom, with hidebound, general marasmus, or wasting and loss of appetite. In the fæces, though fluid, may be found hardened masses as indicating quite a different condition in some parts of the canal from others, while casts of mucus, sometimes mistaken for worms, are commingled with jelly-like material and bloody shreds of membrane. A particularly offensive odour characterizes the evacuations. In fatal cases there is an increase of abdominal pain, thirst, exhaustion, and prolonged fever. Only in the stage of collapse is the temperature lowered, and it may then fall below normal. Dysentery, unlike other bowel affections, does not usually carry off its victims in a few hours, or days, but may continue for weeks. In

the later stages only do we see the worn and anxious countenance associated with acute intestinal affections.

Treatment.—More reliance is to be placed upon good nursing and hygienic conditions than actual medicines, a suitable dietary being the chief consideration. Given a warm, dry, well-ventilated stable, we have next to consider the most suitable food, which must be free from irritating properties, easy of digestion, nutritious, and soft. In eggs and milk, gruel and meal, we have these desiderata, and they may be supplemented with port-wine, while some would add beef-tea.

When there is much evidence of pain, opium may be given in small and repeated doses. When the evacuations produce a foul atmosphere and the season compels closed doors, it may be corrected to an extent by the internal administration of carbolic acid, as well as the use of disinfectants and deodorizers in the building. If carbolic acid is chosen as an internal agent, it should be dissolved in glycerine, or rubbed up with soft soap and freely diluted in water, or given in gruel. Chlorodyne is extremely valuable in some instances, and bismuth, in powder as trisnitrate, or subcarbonate, is recommended as a means of forming a coating over the broken surface of the membrane. Maintenance of surface warmth should not be neglected; the legs should be bandaged with woollen, and the body clothed with warm wraps. Increased circulation in the skin and extremities is a favourable symptom. Despite the most assiduous care many cases terminate fatally, but the proportion of recoveries should be an inducement to strenuous efforts and unremitting care.

ENTERITIS

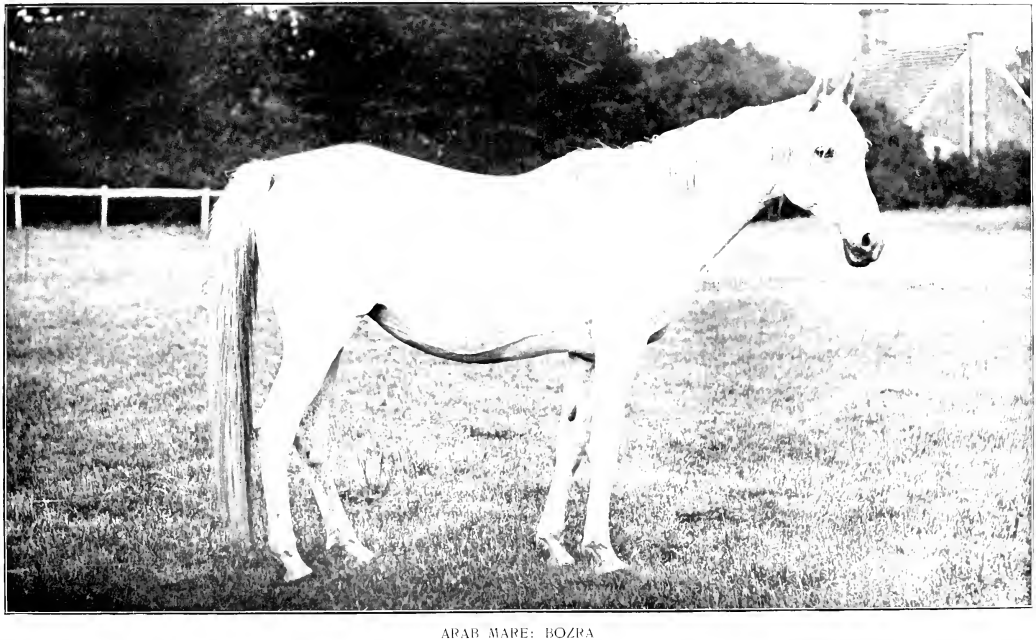
Enteritis, or inflammation of the bowels, is one of the most frequently fatal diseases of the horse with which we have to contend. It may affect the large bowel, the small one, or both. It is the former in which the disease most frequently appears. As to the exact seat of the inflammation, there is no doubt that it commences in the lining membrane, and, with the continuance of the disease, extends outward, involving the substance of the bowel.

Causes.—We are very much in the dark sometimes as to its causation. It may be a sequel to colic and impaction of the bowel, over-fatigue and exposure to vicissitudes of weather, wading through streams when heated by the chase, chemical irritants, vegetable poisons, strangulation, &c. None of these causes, however, are sufficient to account for all the cases of which the experienced veterinarian can speak; more often does he find, on the most careful inquiry and investigation, no clue whatever to the sudden appearance of the disease.

Symptoms.—Although often described as simulating colic, there are marked distinctions to the observant. It may be, and often is the case, that abdominal pain, exhibited in the usual manner, first calls the attendant's notice to the patient. Rigors, or shivering, with coat staring, inappetence, accelerated breathing, great depression, and evacuation of very small quantities of dung, soon follows. The pulse, which in colic only quickens during the paroxysm of pain, is here persistently small, quick, and hard. The membranes of the eyes and nose are red and congested; the eyelid turned up shows the vessels to be full and standing out. The mouth is clammy and tongue dry; the belly may be distended, but is much more frequently contracted—its altered shape is remarkable in a horse with whose outlines one is familiar, having the appearance of being pressed upwards and outwards. From the stage of dull listlessness the patient passes on to one of excitement, stamping the ground, and striking the belly very much in the manner of colic, with occasional uneasy watching and turning of the head towards the flank. In a great many cases we have watched throughout the attack there has been very little violence, more often an uneasy scraping with the front foot, the attendants not being able to realize the gravity of the disease, but supposing it to be a mild attack of gripes. There are no intervals of ease here as in colic, and rarely any desire for food or water; the thirst which accompanies high temperature in man is rarely present in horses. All, except in the stage of delirium, lie down with much caution, lowering themselves in fear, and in quite a different manner from the griped horse, which may throw himself violently upon the floor of his stall before one can get out of his way. The skin alternates between hot and cold, and patches of perspiration break out from time to time. The ears are cold and the legs variable, one cold and another warm, or three out of four may have a deathly coldness—deathly coldness, we have said, for the experienced hand distinguishes quite different sensations when feeling them, and when feeling the legs of, say, a newly-clipped animal, which are cold from exposure. The eyes become glassy and insensitive to light, the pupil dilated, lips pendulous, ears dropped, the animal sighs, and with difficulty retains his feet, finally staggering and falling, unable to rise again. Constipation is present throughout, and we must not be deceived by the information given at first, that he has had two or three evacuations. In the few cases that recover there is amelioration of the symptoms during the first few hours, the general surface-warmth is restored, and the bowels act somewhat freely; the anxiety of countenance passes off, the patient shows some interest in surrounding objects, and may partake of a little mash or other invalid diet provided.

Treatment.—While it must be admitted that the recoveries in cases of pronounced enteritis bear but a small proportion to the deaths, we must spare no effort, nor cease to use palliative measures so long as the animal is kept alive. Associated as it invariably is with constipation, it was formerly thought good treatment to administer purgatives. There is a common ground of agreement as to keeping down pain with anodynes, and opium or its alkaloids are chosen by most practitioners because the movements of the bowels are best controlled by them. Opium or belladonna in balls or as draughts, or hypodermic solutions of morphia, may be given with advantage. Warm compresses to the abdomen continuously applied, and enemas of warm water containing a small proportion of glycerine thrown into the rectum now and again, will prove serviceable, as will also small quantities of morphia mixed with lard when inserted into the same channel. An improvement may be noted without any action of the bowels, as they remain in a more or less torpid condition till considerable advance towards recovery is made. It is not advisable during convalescence to give an aperient, but to wait for restored function in the injured portion of the bowel. Soft foods, as bran mashes, pulped carrots, and linseed should be given when the appetite returns, and all dry forage removed beyond the patient's reach, a muzzle being used, if necessary, to keep him from eating his bed. With regard to bleeding, no rule can be laid down; it may be advisable in plethoric young horses in hard condition. If it is done at all, it should be in the first stage, for later on it will only add to the depression. Bread scalded with milk and given nearly cold is an excellent food if the sick animal can be got to take it, and a little sugar may be added as an inducement to him to do so, or a sprinkling of salt may be more attractive.

The intestines after death may be found affected in any portion, small or large, but, as we have already pointed out, the latter are by far the most common seat of the disease; a long piece of the canal may be discoloured and swollen, or patches of inflammation, with congested portions occurring between them, may be the form in which the disease exists. In certain forms of enteritis a jelly-like matter between the different layers of the intestine is observed, and the latter may be readily separated with the finger, as their natural cohesion is lost. The mortification which in the majority of cases affects the bowel results in poisoning of the blood, and the septic matter acting on the nerve centres causes death in a very short time.



ARAB MARE: BOZRA

By Rhuallv, dam, Bashish. In the possession of Lady Blunt

PLATE XXVI.

RUPTURE OF THE INTESTINE

This condition is usually brought about by external violence acting upon a distended or overloaded bowel, or it may result from over-distension alone. The force with which a horse comes to the ground when suffering a paroxysm of colic is not unlikely to occasion a rent in the diseased gut, and the same may be said of horses thrown for operative purposes while their bowels are loaded with food. If the texture of the intestine is sound it is capable of very great strain without fracture, but in some cases of rupture it has been predisposed by inflammatory softening.

The symptoms of ruptured intestine are not very definite, it being so often a sequel of other disturbances and not the primary cause of illness. When, as sometimes happens after a full belly, a portion of bowel becomes torn during extra or sudden exertion, there are tolerably certain signs of what is the matter. Here the countenance wears the impress of shock, which differs from the mere expression of pain. There is a look of extreme anxiety and depression, cold extremities, rapidly-falling pulse, hurried breathing, cold, patchy sweats, and the other train of symptoms common to abdominal pain. This accident cannot well be confounded with colic of the spasmodic kind, where there are remissions of pain and restoration of pulse during the intervals. In this case the pain is continuous and severe, and the pulse fails to recover any lost power, even though stimulants be given; all that they do is to give temporary support to the action of the heart. An unusual calm or resignation soon comes over the patient, which is unwilling to move, and persistently stands till the powers of life give out and he falls, either to die immediately or after a few fruitless struggles. This cessation from pain following on a bout of colic, when the animal has been very violent, is misleading to the amateur, who will often assure the professional attendant that the patient is better, though an examination of the membranes of the eye, the pulse, temperature, respiration, and handling of the extremities prove the contrary to anyone conversant with horses in health. Sitting on the haunches has been thought by some to be diagnostic of ruptured bowel, but this peculiar attitude may be assumed as the result of pain from other causes. We have said that with rupture generally comes a period of relief from acute pain, but this is by no means constant; on the contrary, all the symptoms may be aggravated, and instead of stupor delirium may follow.

Treatment is of course out of the question, and consideration for

the animal's suffering, and the possible danger to attendants and other horses in the same stable, should convince the owner of the necessity of slaughter.

INTESTINAL OBSTRUCTION

For various reasons presently to be indicated, we do not include this disorder under the title of constipation. Here the food, or whatever else may be the offending body, is arrested in its course along the bowel, and caused to block up the passage.

Causes.—The causes which bring about intestinal obstruction can invariably be referred either to some abnormal state of the bowel itself, or to the nature and condition of its contents. As to the former, it is found to follow upon both physiological and structural changes. The first is exemplified in that state termed debility of the bowels. Here the muscular portion of the organ fails to carry on its movements with normal activity, and allows the food to accumulate and obstruct the canal. Such cases are most frequently met with in colts which have been ill-fed and badly nourished from the time of weaning, and in old horses long and luxuriously fed on hard food. It is sometimes spoken of as *paresis* of the bowels, and the description is not altogether inappropriate to the affection. The second condition is seen to arise in the form of a thickening of the gut, either as the result of inflammatory action or from the growth in or upon it of one or another of the various forms of tumour, or the passage may be obstructed by the gut being twisted, intussuscepted, or displaced.

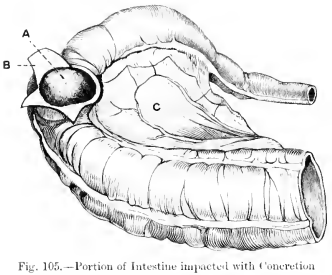


Fig. 105.—Portion of Intestine impacted with Concretion
A, Concretion; B, divided intestine thrown back; C, mesentery.

Where obstruction results from matter contained in the bowels, it is attributable to the indigestion of coarse food imperfectly masticated, or to some foreign substance taken in with it. An equally common cause is the formation of calculi and concretions, fig. 105, or, as they are commonly termed, "stones". These are especially found in horses engaged in town work and living exclusively on dry food.

Symptoms.—The symptoms observed in this disorder are by no means uniform or diagnostic. They may vary from intermittent colicky

pains observed in debility of the bowels, to the most severe paroxysms of suffering exhibited in the twists and entanglements into which they are sometimes accidentally brought. In all cases, however, the discharge of fæces sooner or later ceases.

In order to find out the cause, it is necessary to consider every detail in the history of the case and let in all the side-lights obtainable from every source.

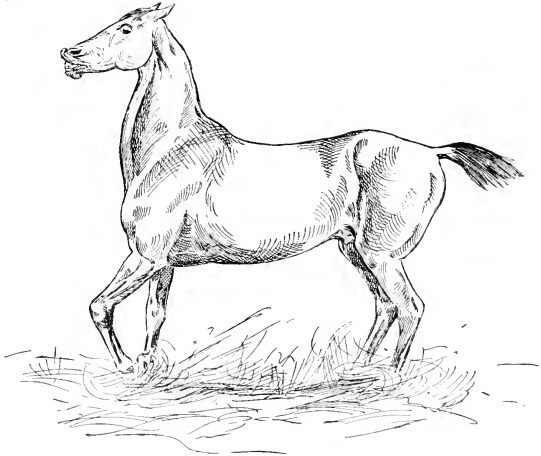


Fig. 106.—Strangulated Bowel

Treatment. — There are many causes of obstruction which yield promptly to purgatives and the method of treatment prescribed under the head of constipation. This is more especially the case with those due to functional impairment of the bowels, but since the cause of obstruction cannot always be definitely ascertained, treatment must sometimes be speculative and the result consequently uncertain.

Oily laxatives, as castor and linseed oils, or aloes, are indicated, and in all cases solid food should be withheld until the obstruction is caused to give way. Some benefit will be found from the repeated injection of enemas of tepid water with which a little salt and salad oil has been mixed. Pain must be subdued by the administration of sedatives and antispasmodics. Here tincture of opium, or the extract of belladonna, or the two

combined, will be found most suitable to the case. Where acute pain exists hot fomentations to the abdomen should be applied, or, as an alternative, mustard or turpentine liniment.

CALCULI (STONES)

Calculi (*calx*, lime) are masses of crystalline matter of stony hardness formed in the interior of hollow organs, such as the bladder, the bowels, the pelvis of the kidney, the ducts of glands, &c. Their form, character, and even position varies with the organ in which they are produced. As a rule they are mainly composed of salts natural to the secretion of the organ in which they are found. Why the salts of these fluids should crystallize out and aggregate together to form large stones it is not easy to say, but there is ground for the belief that they are induced to do so in part, if not wholly, for one of two reasons—either that they are in excess of the normal quantity, or that they are brought into contact with some kind of matter by which they are attracted and upon which they gather, or both these conditions may be concerned in the action.

To what extent, if any, the nature of the food conduces to the formation of stone cannot be stated. It is not found that stone in the bladder, which is chiefly composed of lime, is more prevalent on the chalk formation than elsewhere, and the statement that animals "pastured where lime has recently been laid" become the subjects of calculus requires confirmation. It may, however, be noticed that all conditions which favour the long retention of concentrated saline solutions in an organ predispose to calculus formation, hence it arises that stones or gravel are frequently found to occur where paralysis exists in the bladder or other organs.

INTESTINAL CALCULI

Intestinal calculi are dense masses of earthy matter derived from the salts of the food, and by their close texture assume the form of stones —a term by which they are commonly known. They usually present a gray or yellowish appearance, and a smooth surface more or less polished. In form they are either round or angular (figs. 107, 108).

This difference depends upon the number present. Where they occur in a solitary state they are rounded, but where two or more exist in contact with each other, their constant movement one against the other during the action of the bowels wears away the surfaces of contact, thereby producing flattened facets or concavities and prominent angles. As a rule they are found in a solitary condition, but it is by no means rare to meet with

several together, and the writer has removed as many as sixty from the large bowels of a horse. Where the bowel contains a number, their rubbing action upon each other prevents them from developing to any considerable size, but we have known a single one to reach as much as 65 lbs. weight.

The origin of intestinal calculi is clearly shown by dividing them through the middle with a saw, when it will be found that the centre is occupied by a nucleus of foreign matter, such as a nail, a button, a piece of wire, or particles of grit, &c. &c. If the cut surface of the stone be

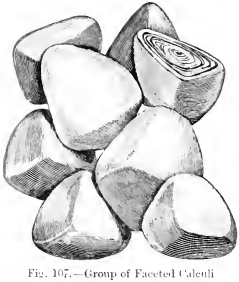


Fig. 107.—Group of Faceted Calculi

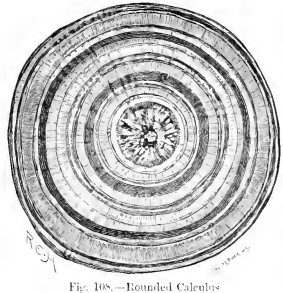


Fig. 108.—Rounded Calculus

examined, and especially after having been roughly polished, it will be seen to be made up of a number of layers of earthy matter placed one outside the other in widening circles. Radiating lines are also seen extending from the centre to the circumference, marking out the calculus into triangular blocks. The outer surface is usually smooth, and in this respect they contrast with similar formations known as "concretions". Calculi are almost invariably found in the large bowel, where their formation and retention are favoured by the peculiar pouched arrangement of the organ. Their composition is expressed in the following analysis by Giradin:—

Ammonio-phosphate of magnesia	48·00
Calcic phosphate	19·00
Water	14·00
Animal matter	·80
Soluble salts, &c.	6·60
Extractive matters	4·00
Fatty matter	7·00
Loss	·60
	100·00

It is generally believed by veterinarians that horses in the possession of millers and bakers are more frequently the subjects of these formations than those employed by other persons. Various reasons have been rendered for this exceptional liability to stone formation. While some attribute it to largely feeding on bran and other offal, others find an explanation in the presence of grit in the sweepings of the mill and bakehouse which the horses of these traders are said to receive. Before special machinery came into use for the removal of foreign matters from hay and chaff a considerable mortality from this cause prevailed in the studs of railway companies, contractors, and other large proprietors.

Where this cleansing process is not adopted obstruction of the bowels by calculi is still a common occurrence.

CONCRETIONS

These formations differ from calculi in the fact that they are made up of masses of vegetable and earthy matter agglomerated together, while the latter consist exclusively of salts which have crystallized out of the fluids of the bowels around a central nucleus.

Fig. 109.—Mixed or Conglomerate Calculus

Concretions, like calculi, are rounded in form, but vary in composition, and also in their structure and external character.

Two kinds of concretions are found in the horse, known as *mixed* concretions or *dung balls*, and *oat-hair* concretions. The former are composed of earthy-looking masses of salts, such as go to make intestinal calculi, loosely incorporated with materials of food—hay, straw, dung, the husk of oats, &c. &c. Mixed concretions (fig. 109) have an irregular, nodulated appearance. They are dark in colour, and much less dense and hard than calculi. When divided they present a rough surface, of loose texture, and in structure resemble calculi in being made up of concentric layers, but of a much thicker and coarser character.

Oat-hair concretions are composed of the fine downy hairs which cover the kernel of the oat, and not, as is universally stated by veterinary writers, of the "beard of oats and other grains".

This formation, like the others, is also rounded, but its surface is regular, and of a soft velvety character. It sometimes occurs that the hairy surface of the concretion becomes covered by a layer of earthy

matter, the same as that composing intestinal calculi, when like them it is rendered smooth and polished, and presents the same outward appearance. It is, however, readily distinguishable by its lightness, and by the woolly texture it displays on section. When a minute portion of this concretion is submitted to the scrutiny of the microscope, it is found to be made up of small slightly curved vegetable hairs, one extremity of which is pointed and the other broad and somewhat square.

What are the conditions which lead to the aggregation of these small bodies, in some instances to the almost complete exclusion of other matters, contained in the bowels, it is impossible to say.

INVERSION OF THE RECTUM

Now and again, in the course of violent paroxysms of straining, the rectum, or posterior bowel, is forced through the anal opening, with the inner or mucous membrane turned outward. The extent to which this extrusion may take place varies in different cases from a few inches to two or three feet. Old animals, brood mares in particular, are more liable to inversion of the rectum than younger ones, and especially those affected with habitual constipation, which appears to act as a predisposing cause. Straining is the inducing factor in the mishap, which sometimes occurs during the pains of parturition or in the course of an attack of colic, or in violent efforts to empty the bladder when the urinary passage is obstructed. It may also arise in the act of straining from severe irritation of the bowels.

Symptoms.—Inversion of the rectum is indicated by the protrusion of a round fleshy-looking mass from the anus (fig. 110). At first it presents a pink or pinkish-red hue, but after having been exposed for some time its colour is greatly heightened by engorgement of the vessels with blood, consequent upon interruption to the circulation. In prolonged exposure the mucous membrane becomes considerably swollen, and black, and softened by infiltration with serum. In this condition the part becomes painful and irritable, and unless carefully guarded the animal will endeavour to rub it against the wall or stall-posts. Should it succeed, the softened and inflamed gut may be irretrievably damaged.

Treatment.—When the bowel has been exposed for some time, and is found to be black, soft, and swollen, an attempt to return it should not be made until the circulation has been restored and the swelling reduced. For this purpose it may require to be scarified with the point of a lancet, *i.e.* punctured here and there lightly with the instrument to give exit to the serum which infiltrates the tissues, and at the same time relieve the

vessels of their burden of blood. This will be rendered more effectual if, after the operation, the protruded gut is wrapped in flannel and well fomented with warm water.

It should be strictly observed that the lancet employed for the purpose is thoroughly clean, and that the flannel is well soaked with carbolic solution, and afterwards well scalded before being used. Neglect of these precautions may provoke fatal blood-poisoning.

It will very materially assist restoration of the circulation if, as soon as observed, the protruding mass is raised and supported on a level with the anus by means of warm flannel.

Before attempting its return the mucous membrane should be freely

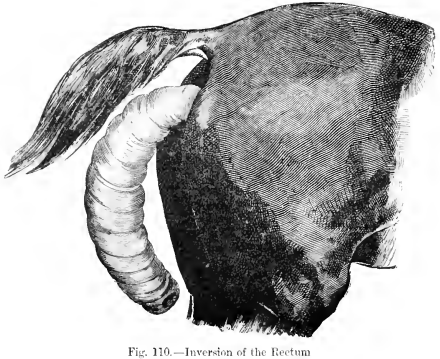


Fig. 110.—Inversion of the Rectum

anointed with carbolized oil, and the hands of the operator should be similarly treated.

If the inversion is considerable the attempt must be commenced at the end nearest the anus, where the bowel should be gently pushed forward by applying the fingers on each side of the gut. When a start has been made at this point and a fair proportion of its length has been replaced, the doubled fist of a small hand may be applied to the other end with gentle forward pressure, which will effect its complete return.

This done, the hand and arm should be allowed to remain in the rectum for a short time, after which a small quantity of warm carbolized oil may be injected into the passage.

A full dose of morphia given subcutaneously will prevent straining. The animal should not be left alone for twelve hours, and only a small quantity of sloppy bran should be allowed during that period. Should the bowel be again inverted, it must be promptly returned and the morphia repeated.

DISEASES OF THE LIVER

CONGESTION OF THE LIVER

Definition.—When the vessels of the liver contain blood in excess of the requirements for bile formation and the nutrition of the gland, it is said to be congested.

Causes.—Accumulation of blood here may result from various causes. Anything that interferes with its outflow from the gland conduces to its congestion. This is why it so frequently coexists with disease of the valves of the heart, which, by obstructing the onward flow of blood, causes it to "back" into the vessels of the liver and produce engorgement; the same may be said of some cases of chronic lung-disease where the blood is interrupted in its course from the right to the left side of the heart. The acute form of the disease commonly results from overfeeding on a too stimulating diet, conjoined with insufficient work and too close stabling. It may also arise in the course of an attack of influenza, strangles, and some other febrile disorders.

Symptoms are not always of such a pronounced character as to render diagnosis easy to the inexperienced. The most pronounced indications of the disease are a yellow discoloration of the membranes lining the eye, the nose, and the mouth, and also the urine. The bowels are rather constipated, or unduly relaxed, and the faeces are foul-smelling. The appetite is more or less impaired, and the animal is dull and heavy and becomes prematurely fatigued. The tongue is furred, and the mouth clammy and emits a sour, unpleasant odour. The pulse and temperature will be increased in proportion to the severity of the attack, and in acute cases deep pressure applied to the right side induces pain. Sometimes there is a tendency to flatulence and an enlargement of the belly.

Treatment.—With the object of relieving the organ of its excessive amount of blood, purgatives are generally employed, and of these the salines are preferable, and may be given in repeated doses over a considerable period. The sulphates of magnesia and soda are amongst the most serviceable and safe of the class, and many horses will take them either in the drinking-water or mixed with the food. Oily aperients are

to be avoided, and aloes should only be given in cases where obstinate constipation exists. Mustard, or some more active counter-irritant, to the right side and over the region of the liver is recommended, and especially in those cases where tenderness in that part is evinced upon moderate pressure. Warm clothing and bandaging, by keeping the surface warm and the skin functionally active, should not be omitted, and gentle walking exercise for a few minutes daily even in bad cases is desirable. The diet should consist as much as possible of green fodder, bran mashes, and carrots, if obtainable, and so long as the disease continues food should be very sparingly given. In the convalescent stages benefit may be derived from the administration of nux vomica and the mineral acids, with increased exercise and a slightly more liberal diet. The fæces assuming a natural colour and consistence, and the animal's spirits returning, may be regarded as proofs of ultimate complete recovery.

JAUNDICE, ICTERUS, THE YELLOWS

This disease is so termed from the yellow discoloration imparted to the tissues of the body by bile, which, in consequence of some functional or structural disorder of the liver, has been allowed to accumulate in the blood.

Causes.—It may originate in the growth of tumours or other organic disease affecting the liver, or, as has been observed, it may follow upon some temporary functional disturbance. It should, however, be noticed that jaundice may be absent in animals whose livers have suffered considerable structural disease, or the tissues may be deeply stained in one whose liver, examined after death, shows no obvious change. In the latter instances it may be regarded as arising out of some functional impairment of the gland.

Symptoms.—In addition to the yellow tint imparted to the visible mucous membranes, there is also more or less discoloration of the urine. The fæces are pale and clay-coloured, and coated with mucus, or they are periodically thin and watery and foul-smelling. In some patients the urine may be stained before any decided symptoms of ill-health are manifested. There soon appears, however, dulness, with lowering head and indisposition to feed. The mouth is dry, clammy, and emits an offensive odour, the skin is harsh, dry, and dirty, and the coat "stares". The pulse remains unchanged, or may be slower than normal, and there is a general want of nervous energy and no disposition for work.

Treatment will depend upon the causes out of which the disorder

arises. If we have been led to suspect a condition of congestion of the liver owing to dietetic errors, we shall first require to unload the bowels by means of an aperient dose of aloes, and then readjust the daily allowance of food, and afterwards submit the patient to a course of salines. Here the sulphates of magnesia and soda may be given, either separately or combined, in doses of two ounces in the morning, in the hope of restoring function and directing the bile into its proper channel. We may further assist the digestive function by providing bile in the form of ox-gall, administered in the form of balls with oatmeal, or the meal of linseed from which the oil has been pressed. The general health should, as far as practicable, be sustained by judicious exercise, ample clothing, friction to the skin, and the administration of vegetable tonics, with which may be combined a small dose of nitrate of potash and common salt, to be given in the food morning and evening. With a decreasing quantity of bile in the urine the mineral acids will be found to hasten convalescence. Animals having once suffered from this disorder should be carefully dieted, guarded against excessive fatigue, and protected from exposure to easterly and north-easterly winds. Four ounces of sulphate of magnesia, given in the food occasionally, will assist in maintaining the normal activity of the liver and in warding off another attack.

HEPATITIS (Inflammation of the Liver)

Inflammation of the liver may assume an *acute* or a *chronic* form. In the former it usually results in the development of one or more abscesses, while in the latter it brings about general enlargement and hardening of the organ, and ultimately contraction and abnormal reduction of size.

ACUTE HEPATITIS

This disease is of rare occurrence in the adult horse, and more prevalent in tropical climates than in Europe.

The reason for this difference is no doubt to be found in the much higher temperature to which horses are exposed in the one as compared with the other.

In foals it is by no means rare in this country as the result of causes presently to be referred to.

Besides the causes named, inflammation of the liver may also arise from external violence, as from a blow over the region of the organ; and there can be no doubt that in rare instances it also follows upon exposure to cold, especially in animals which occupy warm stables and are overfed and underworked

Symptoms.—In acute hepatitis the patient exhibits a dull, heavy appearance. The head hangs low, the eyelids droop, and the face wears an expression of drowsiness. As a rule the membranes of the eye, the nose, and the mouth are more or less yellow. The urine is dark in colour, emits an offensive odour, and throws down on standing a dirty-looking deposit. In some instances there is diarrhœa, and in others constipation, or both these conditions may exist in the same animals at different times. The motions when hard are glazed, or coated with a layer of sticky mucus. Deep pressure in the right flank may cause the animal to wince, and pain is further manifested by the head being occasionally turned in that direction. The mouth is hot and clammy, and fever is present in proportion to the severity of the disorder.

Causes.—As a rule, acute inflammation of the liver owes its origin to disease existing in some neighbouring or remote organ, from which the blood becomes contaminated with septic or putrid matter from some unhealthy wound or abscess. In the adult, ulceration of the bowels, or the stomach, is the more common source of such matter, and from these organs it is readily transferred by means of the blood-vessels into the liver, there to irritate and inflame the gland and provoke the formation of abscess.

In foals it is most frequently seen in connection with that destructive malady commonly termed "joint ill".

Here the wound at the seat of the navel becomes foul and unhealthy, and organisms of putrefaction gain entrance to the liver by following the track of the blood-vessels connecting the one with the other.

Treatment.—Consideration of the nature and origin of the disease affords but little encouragement to hope for the complete success of treatment, whatever benefit may be derived from it, and practical experience bears out this view of the question. At the outset it will be necessary to promote a free action of the bowels, and this may be done by the administration of a dose of sulphate of magnesia, to be followed by the daily administration of a quantity sufficient to maintain a reasonable action of the bowels. Ipecacuanha, by promoting the action of the skin and unloading the liver of bile, will materially aid in relieving the affected organ.

A sharp blister over the right side of the belly should be promptly applied, and the body should be warmly clad in rugs and bandages.

To withhold all food for twenty-four hours will be a distinct benefit to the patient, and so long as the acute symptoms continue he should be restricted to a soft or liquid diet.

HACKNEY MARE, OPHELIA

Sire, Denbigh; dam, Jessie Bell; breeder, Thomas Lax; the property of J. E. Richard, Esq.

CHRONIC INFLAMMATION—CIRRHOSIS

These terms are employed to describe a condition we cannot with any certainty determine during life. It is one of abiding inflammatory irritation of the connective tissue which unites the ducts and secreting lobules of the gland wherein changes of structure occur of a gradually progressive and permanent character. It is more frequently met with than the acute form of inflammatory action already alluded to. At first the liver is increased in volume, as the result of an abiding congestion of its vessels and an excessive growth of connective tissue, which later on undergoes contraction, resulting in wasting and destruction of the gland. As the organ shrinks it becomes hard or *cirrhotic*, and in this condition its function is greatly impaired.

In the more extreme cases of the disease, ascites or dropsy of the belly may result from the contracted state of the liver interrupting the flow of blood from the abdominal organs.

Causes.—It is mostly found in aged horses, after a long spell of luxurious living and indolence combined. It is also seen in association with the presence of parasites, especially the *Echinococcus veterinorum*. But there are many cases which cannot be referred to either of these causes, and for which no special reason can be assigned.

Symptoms.—These are mainly concerned with the digestive function, which for some time before the disease has been suspected will have exhibited indications of increasing impairment. The insufficient and irregular supply of bile furnished by the gland is accountable for the varying state of the bowels, which at one time are constipated, at another unduly relaxed, and now and again the seat of pain, as manifested by symptoms of colic. The mucous membranes, as those of the eyes, nose, and mouth, may or may not present yellow discoloration as a constant condition, but where this is not the case observations made from time to time will sooner or later detect more or less bile-staining, not only of the mucous membranes but also of the urine. Evidence of a disordered digestion is further shown by clamminess of the mouth, and sour breath, flatulency, and thirst. In addition, the patient is dull, unthrifty in appearance, and soon exhausted under work. Lameness of the right fore limb may also be present. In extreme cases dropsy of the belly results from the impediment which the disease has put to the circulation of the liver.

Treatment in the majority of established cases is not very hopeful, but as the extent of the disorganization can never be accurately measured in the living animal, and comparative health may be enjoyed by horses in

whom a limited portion of the liver has ceased to be of any functional value, we should not condemn a case as hopeless until some remedial measures have been tried. A course of saline medicine, preferably sulphate of magnesia, followed by nitrohydrochloric acid and vegetable tonics, should precede a long holiday in a good pasture. By these means there is reason to suppose that the disease is sometimes arrested in its progress, and a period of usefulness may ensue. The symptom of dropsy in the young is not so formidable as in the stabled animal that has seen service, and with a suitable dietary, medicaments may in such cases prove serviceable in restoring the function of the liver and exciting absorption of the fluid which distends the abdomen. Fresh tops of the broom (*Scoparii cacumina*) have the reputation of carrying away abdominal ascites, and failing the plant we may use the decoction prepared according to the British Pharmacopœia. Tonics, by improving the general health, will afford assistance in relieving the local ailment and of preventing further escape of fluid into the belly. Absorbent and diuretic remedies undoubtedly carry away existing accumulations, and should not be overlooked. Here iodide of potassium and nitrate of potash may be employed either separately or together. Tapping the abdomen and removing the fluid bodily is sometimes resorted to, but it is seldom of much use beyond affording temporary relief, unless the liver trouble can at the same time be relieved.

FATTY LIVER

Definition.—Some amount of fat is always to be found in the cells of the healthy liver, but the term fatty liver is used to express a morbid state in which the cells have either accumulated large quantities of fat within themselves from the blood (fatty infiltration), or in which the cell-contents (protoplasm) have become changed into fat (fatty degeneration) (fig. 111).

Causes.—Fatty liver has no constant relation with any specific disease, but it has sometimes been noted to follow on those profound congestions which so frequently attend influenza fever. It is more commonly due to unnatural conditions of life. It is not among the poor and overworked that we look to find it, but in the pampered pet, kept artificially warm, overfed on highly stimulating food, and insufficiently exercised. Brewers' horses, for some reason or other, are specially liable to it. It is a condition antecedent to and favouring rupture and apoplexy, and in its degenerative form is always to be found in cirrhosis of the liver to a greater or less extent. The indiscriminate use of condiments and spices are indirectly responsible for many cases of this disease in the pampered show animal.

Symptoms.—It is only when the disease is far advanced that any tell-tale signs appear. In this stage the belly gives evidence of undue distension after feeding, and a good deal of gas is discharged *per anum* as the result of impaired digestion. As structural alterations proceed, the appetite is liable to fail, and the animal passes through short periods of dulness and becomes prematurely fatigued by work. The fæces are at times offensive and soft, and on these occasions frequently pale in colour.

Treatment.—Where idleness is concerned this may often be summed up in one word—work, which should not be violent and unmeasured, but a gradual change from idleness to activity, from the pernicious use of cattle spices and condiments and artificial stimulation of appetite for rich foods to a simple diet, in amount and quality only sufficient for the muscular exertion required. The frequent employment of purgatives is not to be recommended, but unless the food is judiciously regulated an occasional aperient is most desirable. Epsom-salts, given in 4-ounce doses for two successive days, is perhaps the best agent to employ. Salt with the food should be attended with good results. In speaking of other affections of the liver we have advocated grass, and it may again be recommended here, but a short rather than a deep pasture, where the patient will require to take exercise in obtaining it, is most desirable. By this means the tendency to store up fat in the internal organs is overcome.

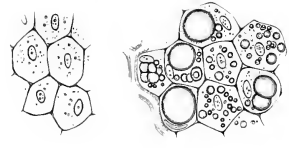


Fig. 111.—Fatty Liver

A, Healthy liver cells. B, Liver cells containing fat globules, the result of disease.

Pathology.—The accumulation of oil-globules in the cells of the liver has the effect of interfering with their functional activity. The size of the liver is not necessarily increased, though such is generally the case, and may be to an enormous extent. Instead of the natural chocolate colour of the healthy gland it is of a light fawn hue. The edges become round and the organ generally is soft, and if cut into, the tissue imparts a greasy feeling to the finger when touched.

RUPTURE OF THE LIVER

Definition.—This condition may involve the gland structure alone, or it may also extend through the fibrous capsule enclosing it.

It is usually attended with more or less internal bleeding. More when the capsule is torn than when it remains intact.

Causes.—These, with the exception of rare examples resulting from external violence, may be said to originate in degenerative changes, by which the gland is rendered soft as the result of its being partly converted into fat from repeated attacks of congestion and other causes.

Symptoms.—Rupture of the liver and capsule is attended with more or less considerable bleeding. This will be evidenced by the pale, bloodless appearance of the lining membranes of the eye, the nose, and the mouth. Moreover, the eyes present a bright, glassy appearance, and the pupil is widely dilated; the pulse is quickened and feeble, and ultimately becomes indistinct. The skin and extremities become cold, and later on the animal breaks out into patchy sweats. The upper lip is raised from time to time, the patient sighs, obstinately stands, and later becomes unsteady in his movements. The muscles of the limbs quiver, and ultimately fail to support him, and he falls and dies.

Treatment.—Treatment is of little avail in these cases. We may, however, prescribe such agents as gallic acid, acetate of lead, and perchloride of iron, turpentine, &c., in the hope of arresting hæmorrhage, which is not impossible if the breach has not extended through the capsule. Post-mortem examinations prove that these ruptures may take place without fatal results when the investing membrane of the organ is not broken, and the escaped blood is prevented from passing into the abdominal cavity.

ABDOMINAL ASCITES—DROPSY

Definition.—An accumulation of serous or sero-fibrinous fluid within the abdominal cavity.

Causes.—Although an occasional sequel to peritonitis of a chronic type, it is in most instances wholly unconnected with it. Young animals, when pastured on low-lying marsh land through the cold months of winter, and compelled, as some are, to live exclusively on the poor, innutritious herbage which such soil affords, are frequently the subjects of dropsy. The deleterious effects of such living are materially aggravated by the absence of shelter and the cold, wet ground on which they lie. These cases are the result of a disproportion between the fluid and solid constituents of the blood, the ingestion of succulent innutritious food for a long period causing an excess of the former over the latter. In addition to this, a dropsical belly may be the result of chronic disease going on in other organs, as the heart, the liver, and the kidneys. In the heart it indicates some obstructive disorder interfering with the passage of blood from the right to the left side, when the blood is thrown back on

the abdominal organs. In the liver and the kidneys it follows upon degenerative changes in their structure. Moreover, any pressure upon or obstruction in the vessels of the liver by which the blood is interrupted in its onward flow may become a cause of abdominal ascites. In old brood-mares it is said to be due to the continued pressure of the gravid uterus upon the large veins of the abdomen.

Symptoms.—Until enlargement of the abdomen is apparent, there is little that is diagnostic of fluid accumulating within. The first indication of existing disease has reference to the animal's general condition, the decline of which is marked by dulness, a want of animation, a staring coat, tightness of the skin, and general debility. There will be wasting of the muscles, particularly those along the back, and a diffused swelling may appear beneath the belly. At this time the latter may show more or less general enlargement, and a tendency to drop and become pendulous. On a more minute examination we find the pulse to be small and weak, and a blanching of the visible membranes.

With the progress of abdominal dropsy the limbs not infrequently become enlarged, but vary in size from time to time. Palpitation of the heart may exist either as a sign of great weakness or of heart disease; too much importance, therefore, must not be attached to this symptom until its cause has been satisfactorily made out. We are directed to the liver when the urine becomes loaded with biliary matter and the visible mucous membranes present a yellow discoloration. Indigestion, inappetence, a clammy mouth, and bad-smelling faeces are also prominent among the symptoms of dropsy resulting from changes in the liver. The presence of albumen in the urine suggests changes in the kidney. Some idea of the extent of the dropsy or quantity of fluid within the abdominal parietes may be obtained by palpation. We cannot take our patient, unless it is a very small pony, as we would a dog, and with hands on either flank feel the impact of a wave set in motion on one side by a blow on the other, but this test can be applied in a more or less satisfactory manner when an assistant is directed to push the right flank smartly towards the left, on which our own hand is placed, or vice versa.

Treatment.—From the previous remarks, in which we have endeavoured to state some of the many causes of abdominal ascites, it will be apparent that without a correct diagnosis as to the causation of the malady we cannot hope to benefit our patient, only so far as may result from placing him under favourable hygienic conditions.

The half-starved colt will profit by a more liberal dietary, which will restore to the blood its solid constituents, and to this may be added preparations of iron and diuretics. The former help to build up red blood

corpuscles and enrich the circulating fluid, while the latter impart functional energy to the kidneys and cause the removal of the effused fluid. Much judgment is needed in the apportionment both of rations and medicines; a sudden change from semi-starvation to plenty being dangerous, and the exhibition of iron having a tendency to occasional constipation, this should be corrected by laxative foods.

In the dropsy of matured and aged animals, where we suspect heart weakness, or where disease of the valves of that organ is made out by auscultation, the treatment will be directed towards regulating the heart's action, and general tonics will be prescribed to strengthen the system. In those patients in which albumen is being voided in the urine, much stimulation of the kidneys with diuretics is to be avoided, and doses of iron, preferably the perchloride in form of tincture, will be found beneficial. When dropsy is associated with liver disease, in which the gland becomes hard and contracted, or other structural changes interfere with the hepatic circulation, there is little to be done. Iodide of potassium in three-dram doses twice a day may be tried, with careful dieting, and a three-ounce dose of sulphate of magnesia now and again to regulate the action of the bowels.

Paracentesis, or what is properly known as "tapping", is sometimes resorted to, but is of very doubtful value. When the ordinary measures, as outlined above, wholly fail, it may be assumed that some structural change in one or other of the organs indicated places the case beyond treatment.

SPASM OF THE DIAPHRAGM

The diaphragm is a muscle which, with its broad central tendon, separates the chest from the abdominal cavity. Under some circumstances it is excited to violent contraction, which is repeated at shorter or longer intervals, and sometimes continues for several hours. The contractions are sudden and spasmodic, and so forcible as to shake the entire body from end to end. The morbid action is accompanied by a thumping noise, which might be mistaken for palpitation of the heart, were it not that the sound emanates from a more backward position in the animal's body, and the flanks are considerably agitated at the same time. Moreover, the contractions of the diaphragm and the stroke of the pulse do not occur simultaneously. The heart, however, is more or less sympathetically affected, but in no case should there be any difficulty in distinguishing between derangement of the one organ and of the other, and especially if the moment of the heart's beat be carefully noted and compared with that of the contraction of the diaphragm.

The cause of this morbid action is not very clearly understood. It is known to have followed severe exertion, as after a good burst of speed in the hunting-field, but the writer has known it to occur in the stable after days of idleness, and on one occasion to usher in an attack of colic.

The suddenness of its onset and disappearance, and its behaviour while present, seem to mark it out as a neurotic affection, in which the pneumogastric nerve is most likely specially concerned.

Treatment.—Diffusible stimulants with anodynes, enjoined with warm clothing to the body, are measures most likely to subdue the morbid activity of the muscle. These should be followed by a dose of aperient medicine and a short period of careful dieting.

PARASITIC DISEASES OF THE LIVER

These happily are not numerous in the horse. The chief offenders are the "distomes" or flukes, and the "cestodes" or bladder-worms. Of the former the *Distoma hepaticum*, fig. 112, is the particular species which infests the liver of the horse. Of the latter the *Echinococcus veterinorum*, fig. 113, the cystic or bladder phase of development of the *Tænia echinococcus* of the dog, is the principal, if not the only hydatid parasite infesting the liver of this animal.

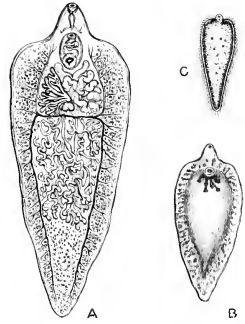


Fig. 112.—Common Liver Fluke (*Distoma hepaticum*)

A, Showing anatomical details. B, Natural size. C, Ciliated embryo or young distome.

The *Distoma hepaticum* in its embryonic condition gains access to the body by means of food and water, and, having reached the small bowels, enters the liver by way of the biliary duct. Here it takes up its abode, and in the course of its growth and development excites irritation in the bile-ducts, leading to thickening and disorganization of their walls, blocking up of the biliary channels, and interruption to the proper discharge of the bile into the alimentary canal. When the parasites exist in considerable numbers the structural changes extend beyond the ducts into the parts around, where an active growth of connective tissue is induced. As a consequence of this the blood-vessels are compressed, the circulation is interfered with, the glandular tissue suffers impairment of nutrition, and its destruction sooner or later follows. Should this destructive

process continue, the function of the liver becomes impaired, and the supply of bile for the purpose of digestion is both insufficient in quantity and indifferent in quality.

In these circumstances the general health gives way, there is loss of strength, swelling of the legs, an unthrifty appearance, and gradual wasting of the body.

These symptoms offer no evidence of the seat and nature of the disease, and it may be that reliable indications of the organ affected will not appear until the last stages of the malady have been reached. The bowels now become irregular, the fæces pale in colour and offensive in odour, the membranes lining the eyelids and the nose assume a yellow appearance, and the urine is similarly discoloured.

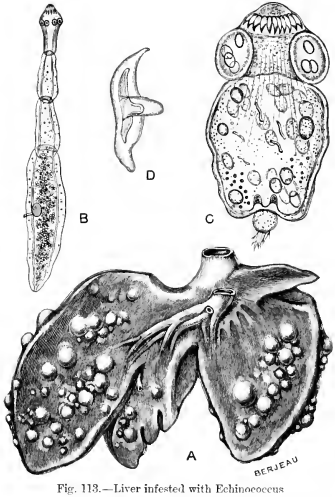


Fig. 113.—Liver infested with Echinococcus

A, Liver studded with echinococcus cysts. B, *Tænia echinococcus*, tape-worm of the dog. C, Embryo or young tænia. D, Hooklet.

The difficulty of diagnosing the existence of parasites in the liver is in some measure a disadvantage, but experience has amply shown that nothing can with safety be given to our patient that will dislodge these distomes from their stronghold. In view of this fact, the great object of treatment should be to uphold the animal's strength by the administration of vegetable and mineral tonics in a plentiful supply of good nutritious food. A small quantity of common salt may also be given daily, and with these measures good nursing and healthy surroundings should be enjoined. If the damage inflicted on the liver is not great, the parasites will in the ordinary course quit the organ, and a return to health may be anticipated.

Echinococcosis of the liver, as it is termed, is the result of the invasion of that organ by the embryo of a tape-worm (*Tænia echinococcus*) which infests the intestines of the dog. As in the case of the distomes just noticed, the mode by which the parasites gain access to the body is

through the medium of food and water. The dog having discharged with his excrement the segments of the tape-worm, charged with eggs, the latter will sooner or later be set free and become accessible to horses and other animals in their food or water. Deposited on pasture land the ova of the parasite would be taken up in grazing, and, having reached the intestine of the equine host, would then hatch out.

It is believed that at this point the embryo enters the liver by way of the biliary duct, and, having taken up its position in the structure of the gland, proceeds to develop a cyst (fig. 113), or, as it is sometimes called, a *bladder-worm*. After a period of five months it is said to reach the size of a walnut, and may still continue to increase until it becomes as large as an orange.

Water forms the chief contents of the cysts, but from the internal surface new broods of embryo tape-worms are being formed which, should they escape and reach the intestines of the dog, will there mature into the tape-worm *Tænia echinococcus*, from the eggs of which the cysts were originally derived.

One or two, or even more, of these bladder-worms may exist in the substance of the liver without in any way upsetting the balance of health, but where large numbers crowd the organ and forcibly compress the blood-vessels, much of the gland structure is broken up and its functions correspondingly impaired. In the former case the hydatids perish, and become resolved into small pasty or mortar-like masses. In the latter they enfeeble and slowly destroy their host, when many of those which survive, if consumed by the dog, will develop into tape-worms.

The symptoms occasioned by these parasites are such as are met with when the liver becomes infested with flukes, and seldom afford any clue to the precise cause of the disease. For a long time they may but faintly indicate the organ attacked. The measures of treatment therefore recommended in the one case may also be followed in the other.

HERNIA OR RUPTURE

Definition.—Hernia is the protrusion of an organ, or part of an organ, from its proper cavity, whether as the result of a rent in the tissues, as when the belly is broken, or an escape through a natural or imperfectly-closed orifice, as in inguinal and umbilical hernia.

It is convenient to divide ruptures into two classes, viz., *congenital* and *acquired*: in the one the defect is present at the time of birth; in the other it is brought about afterwards, by accident or disease. The causes of this latter form of the malady are severe straining, as in heavy

draught, jumping, rearing, rolling, and kicking, or it may follow upon some form of external violence, as kicks from other horses, horning by cattle, or blows inflicted upon the abdomen in various other ways.

Hernia is described as *reducible* and *irreducible*. It is reducible when it can be returned into its proper place by simple external manipulation or taxis. It is irreducible when its return cannot be effected without a surgical operation.

A rupture is said to be *strangulated* when the orifice through which it passes becomes too small to accommodate the extruded organ without imparting to it considerable pressure, in which case the circulation is interfered with, the blood gathers in the vessels of the escaped viscus, and sooner or later provokes swelling and inflammation in it, which may end in mortification and death of the part.

EXOMPHALUS OR UMBILICAL HERNIA

Definition.—An enlargement of the floor of the belly caused by the extrusion of a portion of bowel or omentum through the navel opening.

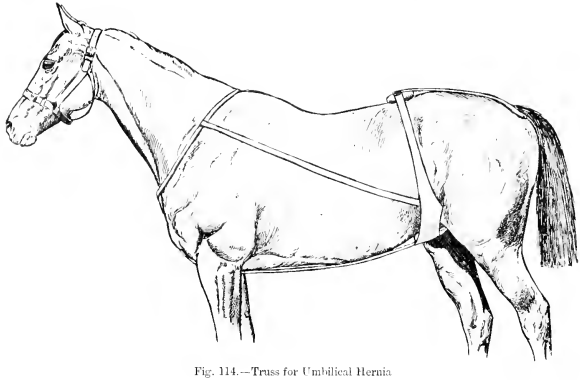


Fig. 114.—Truss for Umbilical Hernia

In foals it is either congenital or occurs very shortly after birth, in consequence of the umbilicus being still pervious or imperfectly closed. In older animals it is usually provoked by blows, some form of severe exertion, and especially jumping, rearing, and kicking when at play. It seldom occurs after the age of one year.

Treatment.—Umbilical hernia very frequently disappears altogether without being subjected to treatment of any kind. This spontaneous removal of the gut from its pouch is believed to arise in many instances from a natural shortening of the membrane (mesentery) by which the intestines are suspended from the spine. It may also occur as a result of the opening becoming closed, the bowel being thus dislodged from its sac and restored to its proper cavity.

Fig. 115.—Clamp for Umbilical Hernia

Where these natural means of cure do not come into operation, the early recourse to and frequent application of blisters over the seat of enlargement will often suffice to fill in the aperture and restore the parts to a normal condition, especially if at the same time the patient be put on a spare diet and kept in quiet confinement. It is most important to the success of any treatment that distension of the bowels be avoided, since increase of the pressure from within tends to force them through the opening and prevent its closure.

Trusses are very difficult to keep adjusted in foals, but when this can be done they are very helpful if applied over a pad of tow the day

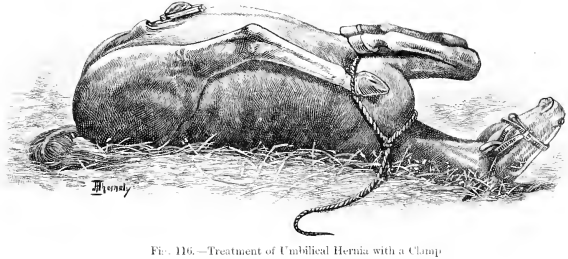


Fig. 116.—Treatment of Umbilical Hernia with a Clamp

following the application of a blister. The form and adjustment of a suitable truss are shown in fig. 114.

Many foals are successfully operated upon by a simple method of clamping the skin after pushing back the hernia. Before treatment is commenced the animal is prepared for the operation by abstinence from food for twelve hours, and then cast and secured upon his back. By a little careful manipulation the extruded parts are returned, the skin over them is then pinched up into a fold and held in the fingers by an assistant, while a clamp of wood or steel (fig. 115) is placed upon it as close as

possible to the abdomen, and tightly compressed and secured in position by string or a screw.

The instrument is allowed to remain, when in the course of ten or twelve days, the inflammatory action excited in the subcutaneous tissue will have closed the opening in the abdominal wall, and the clamp with the dead compressed skin will fall away, leaving behind a dense firm scar. In adjusting the clamp care must be taken not to use so much pressure as to cut the skin or cause its too speedy death, lest it should fall away before the orifice is filled in.

Fig. 117.—Treatment of Umbilical Hernia with Needles

Another method having the same end in view is the introduction of two metal skewers, or strong needles, beneath the skin of the part, cross-ways (fig. 117), after which a ligature is tightly bound round the skin above them, and allowed to remain until the integument and skewers fall away. In performing this operation the greatest care should be observed that the skin and the instruments to be passed through it are thoroughly clean and disinfected, and above all that the sac is completely emptied of its contents before the skewers are introduced.

INGUINAL HERNIA—BUBONOCELE

These terms are used to indicate the escape and lodgment of some of the abdominal contents in the inguinal canal. Although a common form of rupture in man, it is of rare occurrence in horses, owing chiefly to the horizontal position of the abdomen in the latter, and the slope of the belly throwing the weight of the viscera forward towards the diaphragm, instead of bearing down upon the inguinal region, as in the former. This particular rupture, both in man and beast, is more likely to occur in males than females. In geldings the operation of castration, by inducing wasting of the spermatic cord and contraction of the opening by which the belly communicates with the inguinal canal, renders the occurrence much rarer in them than in stallions.

Causes. The predisposition to both inguinal and scrotal hernia is no doubt hereditary, and as a congenital condition it is well known to veterinary surgeons and castrators.

The very rare occurrence of this form of hernia in geldings seems to furnish a clue to its more common occurrence in stallions, for while in the

former the abdominal ring through which escape of the gut or omentum is effected is very small, in the latter it is very large. This, however, is not the only reason for the greater liability observed in the one as compared with the other. The habitual upright posture which the stallion assumes in the act of copulation, by relaxing the abdominal muscles and causing the intestines to gravitate towards the inguinal region, favours, as in man, their entrance into the inguinal canal, and especially so when the digestive organs are distended with food. The less frequent causes are severe efforts at draught in deep ground, slipping, rolling, rearing, and kicking.

Symptoms.—The inguinal canal being situated in the region of the groin, and practically out of view, the presence of inguinal hernia may be overlooked unless conditions arise in it to provoke pain and draw attention to the affected part. It is by no means a rare occurrence for veterinary surgeons and castrators to find a portion of omentum or "kell", and even a piece of intestine, in the scrotum while removing the testicles, which was not suspected to exist before the purse was laid open; and one or the other of these structures may be lodged in the inguinal canal at the time of operation, and descend and protrude from the scrotal wound after the testicles have been removed and the animal has been allowed to rise. It would appear, therefore, that both inguinal and scrotal hernia may sometimes exist without occasioning symptoms or any inconvenience to the animal whatever. There is no doubt, too, that portions of omentum, and maybe intestine also, which find their way into the inguinal canal during the descent of the testicles, return again spontaneously into the abdominal cavity as the foal acquires strength and age advances.

STRANGULATED INGUINAL HERNIA

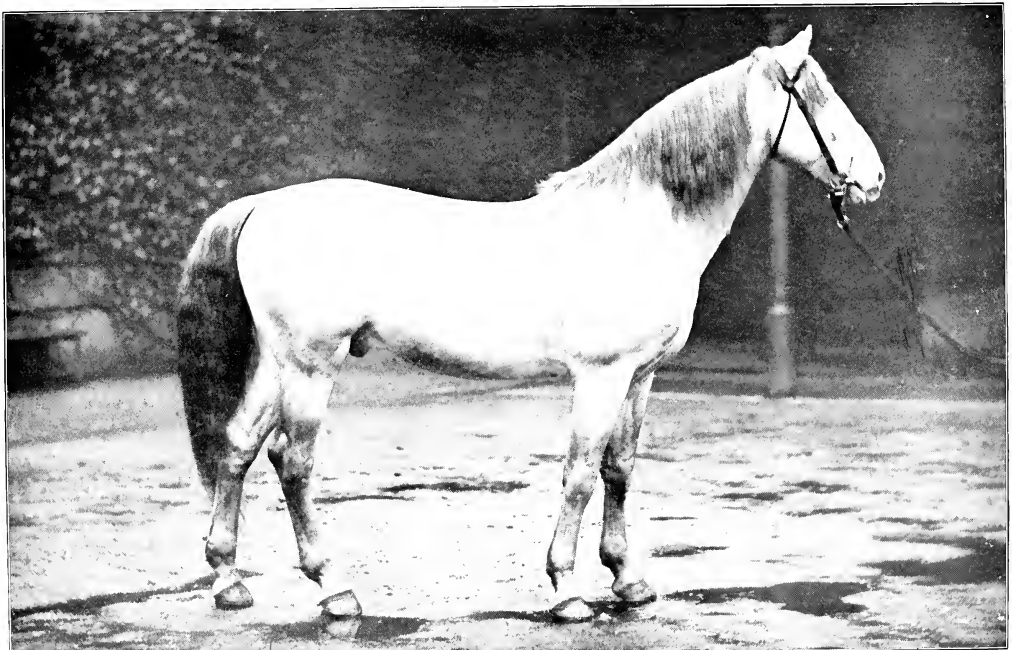
It is more especially in stallions advanced in years, and who have been much used at the stud, that inguinal hernia calls for active treatment. Here the internal abdominal ring having become enlarged, a knuckle of intestine is permitted to enter the inguinal canal. If in this confined space it becomes distended with food and gas, as is most likely to occur, the pressure from within and the resistance from without, by interfering with the circulation, ends in swelling and strangulation of the gut at or about the internal abdominal ring. It is under these circumstances that symptoms are developed which draw attention to the disease. The animal is restless, paws the ground, stretches himself out, and gives evidence of abdominal pain by looking back at the flank, crouching and lying down, or he sits on his haunches like a dog. The hind-limbs are moved somewhat stiffly in progression, and the testicle on the affected side in

particular rises and falls. Unless relief is afforded inflammation attacks the extruded parts, the pain becomes more severe and persistent, the scrotum and flank are bedewed with perspiration, the pulse is increased in frequency, and the breathing becomes quick and panting.

The occurrence of some or all of these symptoms in a stallion should always excite suspicion, and no time should be lost in the application of appropriate means of diagnosis. If inguinal hernia exists, the spermatic cord by which the testicle is suspended will be found to be more or less swollen, but the most reliable indication of the disease is afforded by passing the greased hand well into the rectum. If, when this has been done, the hand is directed downward and outward, it will be brought into contact with the internal abdominal ring, where, if present, the imprisoned gut will be felt.

Treatment.—From the previous remarks it will be gathered that the treatment in inguinal hernia is not necessarily required save when the hernia is strangulated, or the operation of castration is to be performed. Before resorting to extreme measures, it is always desirable to attempt to extricate the bowel from its abnormal position by ordinary manipulation, in which case the rectum is first emptied of its fæcal contents, and then the hand, having been well anointed with vaseline or oil, is introduced into it and carried as directed above to the internal abdominal ring. By a little careful traction on the imprisoned gut it may sometimes be liberated without further trouble. If it cannot be done so, the horse must be cast and put under the restraining influence of chloroform. In this condition he is placed on his back, the hind-quarters are raised by underpacking with straw, and the hind-leg on the side of the hernia is drawn slightly forward and away from the body. In this position the food contents of the displaced gut are encouraged to return into the more depending part of the bowel, and by reducing the volume of the hernia its withdrawal from the inguinal canal is facilitated. One hand should now be introduced into the rectum and gentle traction again made on the imprisoned bowel. At the same time an assistant will appose the palm of his hand or hands to the hernia, and while applying gentle downward pressure to the base, will carefully manipulate the neck with the fingers in such a way as to cause the food and gas confined within it to pass out, and by still further reducing the size of the imprisoned mass hasten its return.

Promise of success will be indicated if the enlargement diminishes in size and the bowel shows a disposition to yield to the traction from within. If, however, no change is perceptible in these respects after reasonable effort, the attempt should cease until the imprisoned gut has been released by surgical operation.



HANOVERIAN

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PLATE XXVII.

Where strangulation is known to have existed for some time this should be resorted to at once without delay.

Under such circumstances the intestine will be inflamed, swollen, and soft, and may be easily torn or fatally damaged in any attempt to relieve it by taxis.

The operation referred to (herniotomy) consists in enlarging the internal abdominal ring in order to remove the constriction and allow the gut to pass back into the belly.

For this purpose the patient must be kept under the influence of chloroform and strict antiseptic methods observed. The skin and underlying membrane (dartos) are cut through and carefully dissected from the peritoneal sac (tunica reflexa) in which the gut is contained. A small opening is now made into the sac, and the finger passed along it in the direction of the internal ring in search of the constricted spot. When this has been found the herniotome is passed into the opening, and, following the finger, is brought to the seat of strangulation; the back of the instrument is then turned towards the bowel, and the blade towards the outer part of the ring. It is now brought into action by opening the handles. A very slight incision is sufficient to set free the strangulated bowel, unless, as a result of inflammation, it has become adherent to the sac.

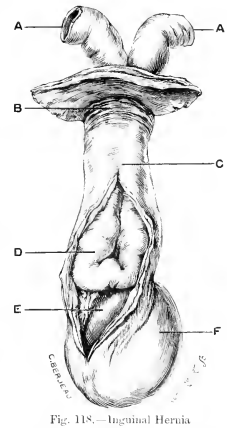


Fig. 118.—Inguinal Hernia

A A, Intestine. B, Internal abdominal ring. C, Inguinal canal. D, Knuckle of intestine. E, Testicle, and F its enclosing sac.

Should this be found to be the case the adhesions must be carefully broken down with the finger and the parts returned.

Castration by the "covered operation" should follow liberation of the gut. In this method the tunica vaginalis reflexa and the spermatic cord are securely included between a pair of clamps, which must be adjusted as high up above the testicles as possible. After the wound has been freely dressed with some antiseptic dressing the patient is allowed to rise.

Williams, in his *Principles and Practice of Veterinary Surgery*, in referring to this operation, observes: "I consider this method a very undesirable one, and calculated to be succeeded by very unsatisfactory results; and even if it were always successful, I fail to see the advantage of dissecting the skin and dartos muscle from the tunica vaginalis, and

making a wound that is sure to suppurate profusely, when a much more simple method, namely, that of including the scrotum in a plain clamp, can be more easily performed". He recommends, then, that when a hernia is present the intestine should be "returned into the abdomen, and the scrotum and its contents on the side of the hernia included in a strong wooden clamp (not a caustic clamp) placed as close to the external ring as possible, and the whole mass allowed to slough".

While this destructive process is going on on one side of the instrument a constructive one is going on in the vicinity of the inguinal canal, where the structures above the clams are being united together, and the aperture closed against a recurrence of the mishap.

It is most important that measures should now be taken to prevent any recurrence of the accident. Before the animal returns to his stable provision should be made in the stall for raising the hind-quarters by underpacking with peat or straw, or both, so that the bowels may be inclined forward, and so directed away from the enlarged ring. Nothing but gruel should be given for the first twelve hours, and the diet for the subsequent forty-eight hours must contain but little solid matter. Bran scalded with linseed-tea or oatmeal-gruel, and given as sloppy mashes, is the most suitable aliment, to which may be added a little salt and malt meal.

SCROTAL HERNIA

This form of the disease exists when, instead of being arrested in the inguinal canal, the displaced gut or mesentery descends through it into the scrotum or purse.

Scrotal hernia, like inguinal hernia, is sometimes congenital, and especially in weakly foals, in which case it may either gradually disappear as the animal acquires strength or assume a chronic state.

It has been observed in many instances to increase in volume during the first few months of the foal's life and then to diminish gradually, the alteration being more or less coincident with weaning, and the substitution of food less disposed to distend the abdomen than summer grass. If the abnormality is not naturally remedied during the first eighteen months of the horse's life it may be regarded as established or chronic.

Animals affected with congenital scrotal hernia may continue to work for years, and even to the end of their lives, without suffering any untoward result, but in those cases where it occurs in aged horses the liability to strangulation of the imprisoned gut is greatly increased.

This description of hernia is not always detected at birth, but may become noticeable a few days or weeks afterwards.

As an acquired disease it is most frequently seen in aged stallions, when as a result of progressive relaxation and enlargement of the internal abdominal ring and the inguinal canal the entrance of the bowel into the scrotum is facilitated.

It is in this latter form of disease that trouble is to be feared, much more so than where the malady occurs early in life and exists as a chronic congenital disorder.

Symptoms.—The presence of scrotal hernia is marked by an increase in the size of the scrotum on the affected side, but inasmuch as the volume of this sac may be augmented by other causes than that of hernia, a careful manipulation of the part and nice discrimination will be required in order to arrive at a correct diagnosis. The presence of a portion of bowel in the purse will be indicated (i) if the enlargement varies in size from time to time, or wholly disappears and returns again; (ii) if the swelling is springy and elastic to the touch, like confined air, or if it is soft and pits to pressure of the finger, or if these conditions are alternately present at different times; (iii) if pressure applied to the scrotum produces a gurgling sound, and at the same time a reduction in the size of the scrotum; (iv) if when the patient is made to cough by compressing the throat the enlargement increases.

Any opinion formed from external manipulation must be confirmed by passing the hand into the rectum and examining the internal abdominal ring as directed for inguinal hernia.

Treatment.—In some cases of this disease the hernia will in part or altogether disappear, and especially after a roll or a long period of fasting, but only to return again. If the escaped gut becomes inordinately distended with food compression and strangulation may result, where symptoms indicative of suffering, such as were described in speaking of inguinal hernia, will be manifested.

Here again in the matter of treatment taxis must precede surgical interference. An attempt must be made to relieve the bowel through the medium of the rectum and by manipulation of the hernia as advised in the preceding article. For this purpose the horse is cast, chloroformed, and placed on his back, and underpacked in the manner described for inguinal hernia.

Should this fail, then it will be necessary to liberate the gut by dividing the point of constriction. This having been done the animal must be castrated by the covered operation, and after free irrigation of the parts with antiseptic dressing he is allowed to rise. If symptoms of acute pain follow the operation, a bold dose of opium may be administered and hot cloths applied to the region of the scrotum.

In the matter of feeding and general management the patient should be dealt with as prescribed in inguinal hernia.

VENTRAL HERNIA

In speaking of umbilical hernia we pointed out that the escape of the abdominal contents took place through a natural opening (navel or umbilical opening). In ventral hernia it is otherwise. Here the muscular and fibrous structures of the belly are ruptured by some form of violence.

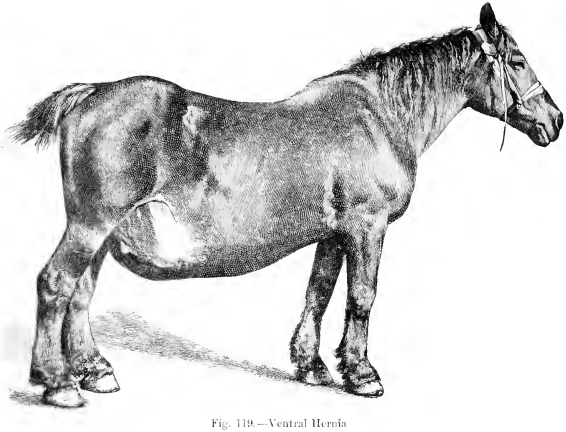


Fig. 119.—Ventral Hernia

The more common causes of this accident are kicks, horning by cattle, falling on to blunt stakes or posts while jumping, sudden and forcible compression in passing through narrow gates, straining in the act of parturition, or when cast in a drain.

Ventral hernia may occur in any part of the abdomen, and will vary in size in accordance with the extent of the rupture. It may be no larger than a cricket-ball, or it may extend from the groin towards the girth for a considerable distance. The contents of the sac usually consist of intestine or omentum, or both may be present at the same time.

Symptoms.—When of recent occurrence the enlargement may be much in excess of the actual size of the hernia, owing to the inflammatory

swelling excited in the injured tissues at the time of the accident. The contused part is hot and painful to pressure, and if the structures have been seriously damaged further enlargement may take place in the course of the formation of an abscess. The writer has known several quarts of matter to form around the hernial sac in the region of the flank. It is not until this extraneous swelling has been removed that the precise extent of the rupture may be determined. In an old hernia, when the inflammatory tumefaction has passed away, the hole in the belly may generally be felt by deep pressure along its circumference. When composed of intestine it will be found to fluctuate to pressure, and to vary in size from time to time according as the escaped bowel may contain much or little food.

Treatment.—Small ventral hernia, like umbilical hernia, may disappear spontaneously, or undergo more or less reduction in size.

When dealt with at the time of its occurrence, the first indication of treatment is to reduce the inflammatory action and swelling by hot fomentations and physic, and prevent further escape of abdominal contents by the application of a compress, which may be extemporized out of a thick pledget of tow, and a long broad bandage made out of an old rug. As the inflammatory swelling subsides, the compress should be drawn tighter round the body. At this time, and throughout the treatment, the patient should be kept on half-rations, which should consist of sloppy bran. Large quantities of bulky food will tend to force the bowels through the opening and prevent its closure. If the rupture is situated backward, the hind-quarters of the animal must be raised by underpacking with litter to displace the weight of the abdominal contents forward. So soon as the inflammation has dispersed, a blister should be applied over and round the enlargement, and repeated again and again. The compress must be allowed to remain on while the blister is acting, and until it is repeated.

Old hernia must be reduced by either clams or ligature, as in the case of umbilical hernia, and under the same precautionary measures. Where they do not interfere with the animal's services they should not be interfered with.

IRREGULARITIES AND DISEASES OF THE TEETH

Since the advent of so-called horse-dentists, and the prominence given to the subject in connection with the illness of the Duke of Westminster's "Orme", the horse-owning public has been awakened to the importance of the teeth as affecting health, and more particularly digestion, in horses. While not endorsing all the extravagant pretensions of the dentists, we

are inclined to think that insufficient attention and even neglect of the teeth may be held to account for many of those obscure cases of failure in general health which are seen from time to time in our horse patients.

Dentition in relation to age is considered in another part of this work, and we wish here only to call attention to those diseases or abnormal conditions which interfere with the proper mastication and insalivation of food, or cause pain and inconvenience to the animal.

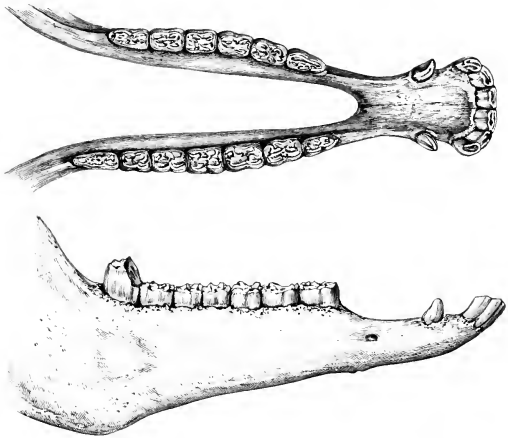


Fig. 129.—Lower Jaw of Horse, showing Numerical Excess of Molars on the Right Side

Irregularities of the teeth may have reference to the process of shedding, to numbers, to growth, and to wear. The majority of colts cast their primary teeth without assistance, and it is only when they are seen to dribble or drop their food that they receive any special attention.

The inflamed gums or Lampas elsewhere referred to may have its origin in the pushing up of the new tooth while the primary one still retains a loose hold upon the gum. In these cases the fang is already absorbed, and the offending crown may usually be removed with ease and without danger. This is done by means of dental forceps. It is a simple operation, requiring only that the neck of the tooth be seized by the instrument, while sufficient care is taken not to injure the growing tooth beneath, or the socket of the jaw in which they are con-

tained. Lancing the tumefied gums is sometimes resorted to with good results.

Numerical Excess and Deficiency of Development of Teeth.—Many instances occur in which the teeth are too numerous. When this is so they are usually crowded together or appear out of their proper place.

This irregularity of numbers may occur in the incisor teeth or the molars, or both. We have known as many as ten of the former to be present in the upper row instead of six, and we have seen as few as two. Seven molar teeth instead of six on one side of the jaw is not of rare occurrence (fig. 120), and we are aware of an instance where only one molar tooth appeared in each jaw. When numerical excess leads to overcrowding, a good deal of pain is the result; and much inconvenience invariably occurs where the supernumerary teeth spring up, as they sometimes do, in the middle of the palate, or immediately within or without the naturally placed row. In the former position they interfere with the tongue, and in the latter with the cheeks, and in both they render mastication difficult, and in some cases almost impossible.

Where the number of teeth is deficient, grazing and mastication are rendered troublesome in proportion to the extent of the loss.

SPECIAL DEFECTS OF THE MOLAR TEETH

Disparity of Length.—In this connection the most common defect is that which results when the first and last molar teeth in the upper and lower row do not exactly cover each other. The upper row may extend a little farther back than the lower one, when a portion of the last tooth of the former, and a portion of the first tooth of the latter, will be out of the line of wear (fig. 121), with the result that the unused parts of the teeth will grow of inordinate length, and sooner or later give rise to difficulty of mastication, and maybe to injury of the gum, or even the jaw-bone. To remedy this defect the projecting portions of the teeth must either be removed with the rasp, or chiselled off with one or other of the various chisels devised for the purpose.

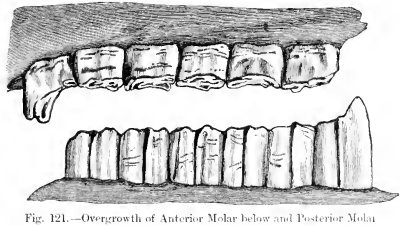


Fig. 121.—Overgrowth of Anterior Molar below and Posterior Molar above from want of Contact

Marginal Irregularity. — The commonest irregularity of the molar teeth is that in which the outer edge of the upper molars, and the inner margin of the lower ones, become ragged and protrude beyond the corresponding margins above and below respectively (fig. 122).

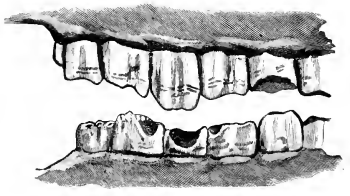
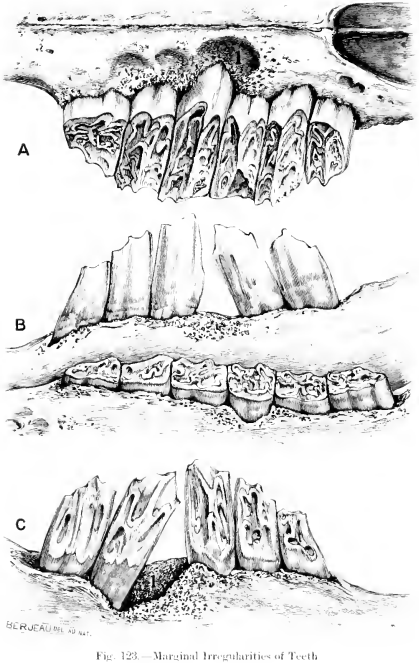


Fig. 122.—Undulating Irregularities of Molars



A, Right side of upper jaw, showing (1) excavation of the bone and abnormal wear of the inner surface of the teeth.

B, Lower jaw, showing corresponding teeth similarly worn on the outer side as in fig. C, and excavation of the jaw (1) by the downward projection of the upper molars.

Fig. 123.—Marginal Irregularities of Teeth

In quite young horses the tables of the molars are practically level, but in course of time they gradually take the direction of inclined planes. The reason why the edges are not kept down by wear is said to be that the upper jaw is wider than the lower one. It has been observed that individuals acquire a habit of grinding their food with a movement almost exclusively from right to left, and irregular wear of

Fig. 124.—Tooth-Rasp

the teeth naturally follows as a consequence. When, from the presence of a decayed or malformed tooth, the motion of the jaw is limited and altered from its normal direction, irregularity is often observed to result at the edges.

The lower molars invariably wear away faster than the upper, but it will be remembered that they are smaller to begin with; those in the middle of the jaw are sometimes worn quite low, while those at either end appear to have escaped a fair amount of work and remain prominent, the surface altogether presenting an undulating character.

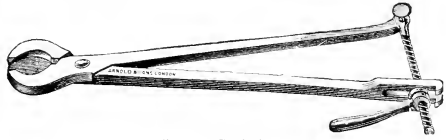


Fig. 125.—Tooth-Shears

We cannot alter the animal's manner of eating, but we can reduce the sharp edges of his teeth from time to time, and remove parts that project unduly. The former operation is accomplished with an instrument known as a tooth-rasp (fig. 124), and requires a considerable expenditure of energy on the part of the operator to perform it effectually. The latter may require the use of tooth-shears. Rasping may often be done without a gag, by simply drawing out the tongue on the opposite side to that upon which the rasp is to be applied. Many horses submit to the proceeding with less opposition, when secured in this simple manner, than they would do if twitch and gag were called into requisition. When the tooth-shears (fig. 125) are to be used, the animal will require to be under more thorough restraint, and is most favourably placed for the operation when cast.

FRACTURE OF THE TEETH

The incisor teeth are sometimes broken by external violence, and the same accident may result to the molar teeth from being brought forcibly together while a piece of stone, or a nail, or some other hard substance is interposed between them.

Fracture of the incisor teeth commonly results from the animal falling forcibly on the mouth. The breakage here is usually in a transverse direction, while in the molars it extends from the crown towards the fang. Much less importance attaches to the one than to the other. Fracture of the latter causes severe toothache, and seriously interferes with mastication, while at the same time it permits the food to enter the *alveolus*, or socket, which gives lodgment to the fangs, and lays the foundation for further mischief.

In all cases where a tooth is fractured vertically, so as to interfere with the fang, it should be removed, or failing this, in case of an incisor, it should be broken off short so that the gum may overgrow the stump. (See "Minor Operations".)

Fractured teeth may be recognized by the blackish-yellow discoloration which they undergo, and the offensive odour they give out, as well as by the accumulation of food in the line of the crack.

CARIES

Decayed teeth are comparatively infrequent. The causes are said to be external injury, and chronic inflammation of contiguous structures, as gums inflamed by lodgment of food in the interdental spaces. It has been observed that caries is more frequent in horses having the teeth abnormally wide apart. Decay may commence at the fang, the neck, or the crown; the neck is perhaps the commonest seat of the disease.

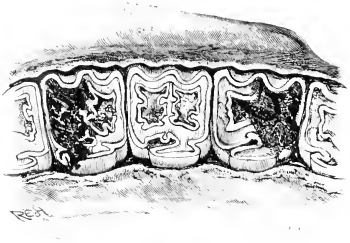


Fig. 126.—Caries

Among the symptoms of this disease are difficult mastication, quidding the food, slobbering at the mouth, enlargement of the jaw, which may be

seen and felt from the outside, and in the case of upper molars a discharge of a fetid nature sometimes takes place through the nostrils. The fourth molar is said to suffer more frequently from caries than any other.

If disease begins at the fang, the life of the tooth is generally short, as nutrition is entirely cut off after a little while. Such a tooth has a dead look, is not quite so high as its fellows, and may be found to be loose. With diseased fangs abscesses are to be feared, and their presence is frequently the first intimation of anything wrong with the teeth. Unless suitable treatment is adopted, disease and disorganization may result and prove very intractable.

But little horse-dentistry has been practised beyond rasping and extraction, and there is little doubt that a good deal of discomfort might be saved, and operations avoided, by suitable stoppings being employed. Decay occurs rarely on the grinding surface, but at the sides; and the few experiments made have been so successful as to warrant us in clearing out a cavity and filling it up with a hard amalgam. This serves to keep out particles of food and prevent fetor of the breath; and provided the cavity is made dry at the time the stopping is introduced, further decay may be for a long time arrested. Gutta percha is a cheap and convenient stopping, and is worth a trial in mouths where the interdental spaces between the teeth are large and allow food to accumulate and prove a chronic source of trouble. It may also be used to fill a gap left where a tooth has been extracted.

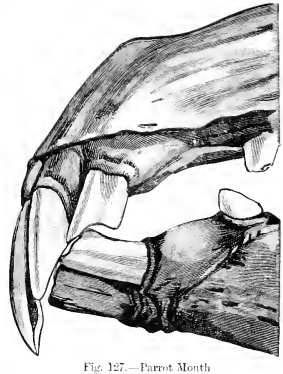


Fig. 127.—Parrot Mouth

PARROT MOUTH

In this deformity the teeth of the upper jaw project beyond those of the lower one, and are consequently not subjected to any attrition or wear (figs. 127 and 128). Where the malformation is extreme, horses are incapable of gathering their food when turned to grass, or accomplish it with some difficulty. They are apt, in consequence, to fall away in flesh, and should always be provided with dry food to make up the deficiency.

In some severe cases of this deformity the lower row of incisor teeth are allowed to come into contact with the roof of the mouth and injure the *bars* or palate. In such cases the offending teeth should undergo periodical rasping to keep them down.

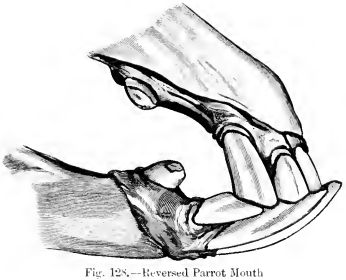


Fig. 128.—Reversed Parrot Mouth

CRIB-BITING

A practice in which some horses indulge has the effect of wearing down the incisor teeth, especially towards the outer edge (fig. 129). It is very seldom, however, that any dental disease or derangement arises out of it.

WOLVES' TEETH

This term is applied to small conical teeth which occasionally appear in front of the grinders of the upper jaw. In the early ancestors of the horse seven molar teeth existed on either side of the upper and lower jaw respectively. The first of the series has long since disappeared from the dental formula, but from time to time it continues to appear in a rudimentary form as what are known

Fig. 129.—Teeth of Crib-Biter

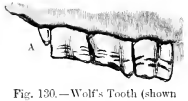


Fig. 130.—Wolf's Tooth (shown at A)

as Wolves' teeth (fig. 130). These vestigial remains, also known as Eye-teeth, were formerly supposed to occasion blindness, and were always promptly removed.

In some districts this erroneous impression still lingers in the minds

of ignorant breakers, who continue to adopt the same unnecessary practice. As matter of fact they produce little if any inconvenience, and usually disappear between two and three years old, when the first and second temporary grinders are shed.

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3. THE URINARY APPARATUS

From an anatomical point of view, the urinary apparatus consists of two kidneys with their ducts, named the *ureters*, which open into a musculo-membranous sac, the bladder, and this again has a tube, short in the female, of considerable length in the male, by which the fluid collected in the bladder is discharged from the body at convenient intervals, and is named the urethra. In the male this tube terminates at the extremity of the penis, which it traverses along its whole length. From a physiological stand-point, the kidneys are organs by which the excess of water, as well as the salts and the nitrogen of the body, are got rid of, the latter substance being chiefly in the form of urea, of uric and hippuric acids, and creatinine, which represent the waste of the proteids or albuminous and albuminoid components of the tissues.

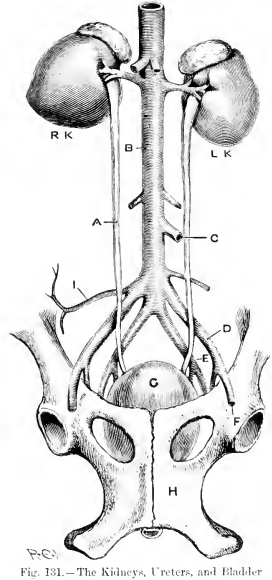

Fig. 131.—The Kidneys, Ureters, and Bladder

R K, Right kidney. L K, Left kidney. A, Right ureter. B, Abdominal aorta. C, D, E, F, I, Arteries arising from the same. G, Bladder. H, Pelvis.

The Kidneys (fig. 131) are two in number, one being situated on each side of the lumbar vertebræ, partly under cover of the last ribs, and resting against the under surface of the loins, where they are embedded in much fat. The right kidney is somewhat heart-shaped and rather the larger of the two. It reaches to the level of the 16th rib and touches the liver in front; it weighs about 27 oz. The left

is more bean-shaped, is situated rather farther backwards than the right, touching the spleen in front, and weighs about 25 ozs. The external surface of each kidney is smooth, and on its inferior surface is in great part covered by the peritoneum or lining membrane of the belly. The inner border is deeply notched to form the *hilus* of the kidney, wherein is lodged the *pelvis*—a small sac or receptacle into which the urine is first received. Here also the renal arteries enter, the renal veins emerge, and the *ureter* begins and continues its course from the pelvis to the bladder. Each kidney is enclosed in a dense membrane or capsule, which in health can be easily stripped off the proper substance of the organ, whilst in some forms of disease it is firmly adherent. If a kidney be divided by a horizontal cut (fig. 132), into an upper and a lower half, a difference in colour will be noticed between the outer cortical portion and the inner medullary portion. The outer or cortical portion is of dark reddish-brown colour and finely granular aspect; the inner or medullary portion is lighter in colour and presents a number of fine lines, converging towards the cavity in the centre of the kidney named the pelvis. Both the cortical and medullary zones are chiefly composed of delicate tubes—the urinary tubules,—together with many blood-vessels, and the difference in their aspect is due to the difference in the form and arrangement of these *tubuli uriniferi*.

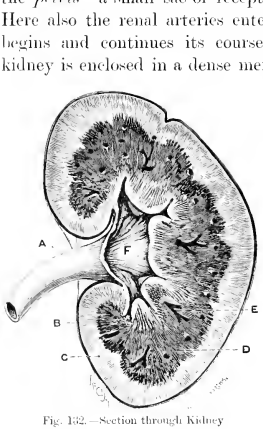

Fig. 132.—Section through Kidney

A, Ureter. B, Renal capsule. C, Cortex. D, Medulla. E, Renal vessels. F, Pelvis.

If we follow one of these tubuli (fig. 133) from its commencement in the outer or cortical substance of the organ to the point where it terminates by opening into the pelvis of the kidney, we find that it begins with a little dilatation or bulb termed the capsule of Malpighi (fig. 133, *c*), about $\frac{1}{125}$th of an inch in diameter, from which proceeds a cylindrical and much-contorted tube that lies in the cortical zone and has a diameter of about $\frac{1}{500}$th of an inch. The tube then enters the internal or medullary zone, where, becoming much narrowed, it forms a long loop, the loop of Henle, and having reascended towards the outer or cortical zone becomes once more coiled, and finally joins with others to form a collecting tube. These winding tubes are lined by a layer of cells which secrete or separate the urine from the blood, after which the collecting tubes convey it into the

pelvis of the kidney, whence it passes into the ureter, and so on to the bladder. The cells by which the urine is secreted vary in form in different parts. Those lining the little bulb or capsule of Malpighi are flattened; those in both of the convoluted portions are columnar and striated or fibrillated; whilst those lining the loop of Henle are flattened and clear in the descending, and striated in the ascending portion. These differences in the character of the cells seem to be associated with differences in function, for, if certain colouring-matters are injected into the blood, they are not found in the cells lining the capsule, but they deeply stain those parts in which the striated cells are found.

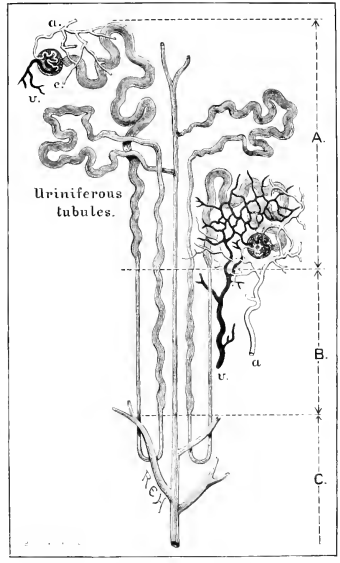

Fig. 133.—Uriniferous Tubules

a, *a*, Artery; *v*, *v*, vein; *c*, Malpighian corpuscle. A, The cortex or cortical substance. B, Boundary layer. C, Papillary portion, showing the loop of Henle.

The arrangement of the blood-vessels of the kidney presents several points of great interest. In the first place they are very large for the size of the organ, and consequently the whole mass of the blood circulating the body traverses the kidneys in a comparatively short space of time. Now the constituents of the urine, being of a poisonous nature, are jealously removed from the blood by the cells of the kidney as soon as they enter it. In consequence of this rapid excretion we find that under healthy conditions very delicate chemical examination is requisite to demonstrate their presence in the blood at all.

Thus, for example, the quantity of urea discoverable in the blood passing to the kidney by the renal arteries does not exceed 0·016 part in 1000 in health, and is still less in the venous blood returning from them.

In the next place, there is a double system of capillary vessels which is not found in any other organ of the body. The renal arteries entering the

kidney at the hilus break up into arches which are situated at the junction of the medullary with the cortical zone. From this region numerous large branches run to the cortex, where they break up into minute afferent branches, one of which runs to each little capsule of Malpighi, and, deeply indenting the wall, divides into a little ball of branching and intertwined capillaries (fig. 133, *a*), which unite together again to form an efferent vessel. This efferent vessel (fig. 133, *c*), which would elsewhere be termed a vein, after a short course again divides, as before, like an artery into a net-work of capillaries which are distributed over the outer side of the cortical and convoluted portion of the renal tubules. These, reuniting, form the proper renal veins by which the blood is conveyed out of the gland.

Mr. Bowman pointed out that the peculiar arrangements of the blood-vessels are well adapted for the secretion and excretion of such a fluid as the urine. The little balls or glomerules of capillaries which are formed by the first divisions of the renal arteries are well adapted to permit the escape of the watery parts of the blood, which, if the expression may be used, flushes the renal tubuli through their entire length, and in doing so dissolves and washes away the urea and hippuric acid and salts which are secreted by the cells lining the convolute portions of the tubules, and which have been separated by them from the blood coursing, under comparatively low pressure, through the second plexus of capillaries which surrounds them.

THE ARRANGEMENTS FOR THE RETENTION AND DISCHARGE OF THE URINE

The urine secreted by the kidneys enters the pelvis of these organs and then trickles down the ureters (fig. 131, A) to the bladder. It is remarkable that a kind of alternation in functional activity takes place between the two kidneys, so that first one and then the other kidney secretes a few drops of urine and rests awhile. The ureters pierce the coats of the bladder obliquely, a disposition of parts which, whilst it presents no obstacle to the flow of urine from the kidney to the bladder, effectually prevents any influx of fluid from the bladder towards the kidney.

The bladder (*a*, fig. 131) is the receptacle which receives and retains for some hours and then expels the urine which is excreted. It weighs about a pound, and when distended it is capable of containing about four quarts of fluid. It is situated above the pubes and below the rectum, and is covered in front and behind by the peritoneum; inferiorly this coat is wanting. When greatly distended the bladder projects forwards into the abdomen, but in the ordinary condition of being partially filled it is contained within the bony pelvis. It is a musculo-membranous bag. The

CHAMPION STALLION: AMERICAN TROTTER, CRESCENS

PACING STALLION: AMERICAN TROTTER, STAR POINTER

muscular tissue is arranged in several layers, some fibres being longitudinal, others transverse, and others again oblique, and by their contraction the contents of the cavity can be completely expelled through the urethra. Just beyond the point where the bladder and urethra are continuous, one with the other, the muscular fibres are so arranged as to form a strong muscular band encircling the urethra, to which the name of sphincter of the bladder is applied. The office of this muscle, which is in part under the influence of the will, is to close the orifice of exit from the bladder, and it therefore acts in antagonism to the general muscular coat of the bladder. It is necessary that it should relax before any urine can be expelled. If it loses its tone, the urine can no longer be retained, and incontinence of urine occurs.

The internal coat of the bladder is the mucous membrane. This is a soft, pale rose-coloured layer, which is continuous before and above with the membrane lining the ureters, and behind and below with that lining the urethra. In the empty bladder it presents folds or rugæ, which are obliterated as the urine accumulates and distends the organ. It is composed of an external layer of connective tissue, which is in accurate contact with the muscular coat, and of several layers of epithelial cells. The bladder is well supplied with blood-vessels, nerves, and lymphatics. The arteries are derived from the branches of the internal pudic, and the veins return the blood to the internal pudic veins. The lymphatics form a close network on and internal to the muscular layers, and discharge their contents into the sublumbar glands. The nerves are derived from the hypogastric plexus, and partly proceed from the spinal cord and partly from the great sympathetic nerve. The nerve centre controlling the act of staling is situated in the spinal cord at the lower part of the lumbar region, as is shown by the fact that after division of the spinal cord in the dorsal region the bladder can be stimulated to discharge its contents by the application of cold to the buttocks; ordinarily, however, the sensation of fulness of the bladder excites consciousness, and impulses proceed from the brain which, on the one hand, cause the sphincter guarding the opening from the bladder to relax and allow the urine to escape, and, on the other hand, cause the muscular tissue forming the walls of the bladder to contract and force it out.

THE QUANTITY AND COMPOSITION OF THE URINE

The quantity of urine secreted depends, of course, chiefly upon the quantity of water that has been ingested, but it is in part determined also by the activity of the skin. With free exercise, and abundant sweat-

ing in dry air and in hot weather, the quantity is diminished, whilst it is increased when the animal is at rest and exposed to cold. The quantity discharged per diem varies under these circumstances, and with the size of the animal, from four or five quarts, which is about the average, to twelve or more, or putting it in another form, from about one-quarter to one-half ounce for each one pound of the body weight of the animal. It is more abundant, as might naturally be expected, in grass-fed animals than in those whose food is confined to such dry matter as oats and hay.

When first emitted the urine of the horse is a clear yellowish fluid, but it soon becomes turbid. It has a peculiar and rather unpleasant

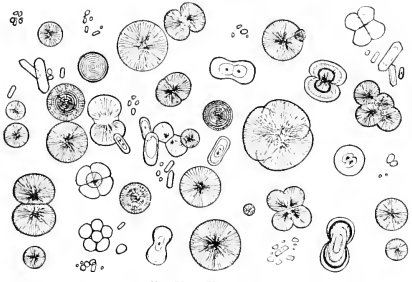

Fig. 134.—Urine Salts

Various forms of calcic carbonates and ammonium urates found in normal urine of the horse.

odour, and a specific gravity of about 1·042, but varying from 1·030 to 1·055 or more. Its reaction to test-paper is always alkaline in health, the alkalinity being chiefly due to the presence of potassium bicarbonate.

When the urine of the horse is analysed it is found that in every 1000 parts there are about 905–910 of water, 55 of organic substances, and 40 of inorganic substances. The organic substances include urea, hippuric, benzoic, uric, and oxalic acids and their salts, with mucus and epithelial scales from the lining membrane of the bladder and urethra; whilst the inorganic substances are represented by the lactates, carbonates, sulphates, and, in very small quantity, phosphates of the metals sodium, potassium, calcium, and magnesium, with some chloride of sodium and silica. The relative proportions of these vary greatly with the nature of the food, and also according as it has been examined when taken from the animal in the fasting state or during full digestion.

The urine of the horse contains, in addition, a considerable quantity

of the aromatic substances named phenolkresol and indoxyl combined with sulphuric acid, as well as the compound named Brenz- or Pyro-catechin, which is partly free and partly also combined with sulphuric acid.

Pyro-catechin exposed to the air in an alkaline solution absorbs oxygen and becomes brown, which is probably the cause of the darkening in hue which the urine of the horse undergoes after expulsion from the bladder.

Veterinary Captain F. Smith, in a paper contained in the *Proceedings of the Royal Society* gives the following instructive table showing the mean composition of the urine of the horse for twenty-four hours at rest and at work:—

	Rest.	Work.
Quantity	8·689 pints. ...	7·877 pints.
Specific gravity	1·036	1·036
Total solids	8·114 ..	8·188
Organic solids	5·115 ...	5·368
Inorganic solids	2·94	2·820
Urea	... 3·4744 oz.	
Ammonium carbonate as urea ...	.. ·4626	
Ammonia	·887	·187
Benzoic acid	·23	
Hippuric acid	.. ...	·549
Phosphoric anhydride	·046	·067
Sulphuric anhydride	·375	·539
Other sulphur compounds ...	·258	·271
Chlorine	1·118	·775
Calcium oxide	·121	·067
Magnesium oxide	·105	·093
Potassium	1·290	·954
Sodium	·088	·064

The difference in the size and breed of the animal probably accounts for the great discrepancies in the analyses of the urine of the horse that have been published. In some analyses made by Wessinger, who experimented upon animals of Hungarian breed, it was found that the specific gravity varied from 1·042 to 1·046, and that the amount of dry residue after evaporation amounted to 6176–5404 grains per diem. The quantity of chlorine varied within wide limits, but it may be taken at 400–500 grains. The quantity of sulphuric acid was 262 grains. The quantity of nitrogen varied in health from 994 grains to 1698 grains, the mean being 1193·5 grains. It is remarkable that the phosphates ingested with the food are only eliminated in small quantity by the horse in the urine, whilst in carnivora they are contained in large quantity. In the horse, the phosphates are discharged from the body by the bowels. The alkaline and

earthy bases are chiefly combined with sulphuric acid, though a portion are in combination with carbon dioxide, and it is the lime carbonate in minute delicate crystals that gives the cloudy appearance to the urine of the horse, sometimes even when quite freshly drawn. A small quantity of nitrogen is eliminated in the form of ammonia and the salts of that alkali, but the proportion discharged from the system in this form, as compared with the total amount of nitrogen, is only as 1 : 214.

A few observations may be made upon each of the principal constituents of the urine. The first and most important of the organic constituents is the *urea*, the composition of which is $CO(NH_2)_2$. The interest attaching to this substance is that nitrogen constitutes nearly half its weight (46·6 per cent). Now nitrogen does not enter into the composition of either the fats or the starchy or saccharine components of our food, whilst it constitutes about 16 per cent of the various proteids, such as those which form the greater part of flesh, and are found in blood, milk, eggs, and in the gluten of fruits and seeds of the cereals and leguminous plants. The quantity of nitrogen which is discharged as urea rises and falls with the quantity of nitrogen-holding substances supplied in the food and absorbed in the intestines, and it thus forms a measure of the amount of proteids that have been ingested. Upon the average 16 grains of nitrogen correspond to 100 grains of dry albumen broken up and consumed in the body. Or, expressing it in another way, every grain of nitrogen in the urine corresponds to the consumption of 30 grains of flesh of the animal, to the manufacture of which it is supposed that all the gluten and albuminoids in the food are applied, and so every grain of urea (= 0·467 N) in the urine corresponds to 13·7 grains of disintegrated flesh of the animal. The quantity of urea in the urine is not materially augmented by muscular work, which is one of the facts relied upon to prove that muscular force is generated, not from the disintegration and metabolism of the muscle itself, but of the starchy and fatty constituents of the body. Just as in a locomotive, the force expended in effecting change of place is derived, not from the wear and tear of the iron framework of the machine, but from the oxygenation and combustion of the carbon of the fuel.

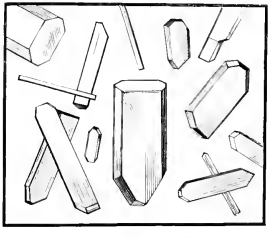

Fig. 135.—Crystals of Urea

The origin of urea, it is believed, must be sought for in a substance

named kreatin, which exists in considerable quantity in the muscles, and from which urea can be artificially obtained in the laboratory. The kreatin of the muscles, or possibly some intermediate substance as ammonium carbonate, is carried by the blood to the liver, and is there converted into urea. This is taken up by the blood and carried to the kidneys, where it is excreted by the cells of the urinary tubules and mixed with the water of the urine. That urea is not formed at or by the kidneys is demonstrated by the fact that it accumulates in the blood after the kidneys have been removed from the body by operation.

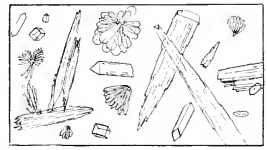

Fig. 136.—Hippuric Acid

Hippuric Acid.—This acid, the name of which (*ἵππος*, horse) is derived from its abundance in the urine of the horse, is closely connected with the aromatic benzoic acid. It can, in fact, be made to appear in the urine of man by the administration of benzoic acid with the food. Its chemical formula is $C_9H_9NO_3$, and it contains 7·8 per cent of nitrogen. When separated from the urine it appears in the forms presented above (fig. 136), which represent large, white, four-sided prisms or elongated needles easily soluble in hot water and in alcohol.

The copious excretion of hippuric acid observed in animals fed on meadow hay is due to the herbs mixed with the grass, but the precise plants from which it is derived do not appear to have been ascertained. It appears in maximum quantities, 2 ozs. per diem or more, in animals fed on wheat and oat straw, but little is found in the urine of those fed on oats or corn, or on bean straw. It seems probable that it is formed in the liver and intestines by the union of glycocine with substances belonging to the benzoic acid series, or this may possibly occur in the kidney itself.

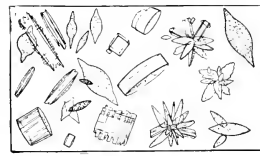

Fig. 137.—Uric Acid

Hippuric acid, which sometimes constitutes as much as 2 per cent of the urine of the horse, is usually combined with calcium and sodium, forming hippurates of those metals.

Uric Acid.—This acid, which has the composition represented by the formula $C_5H_4N_4O_3$, only presents itself as a trace in the normal urine of the adult horse, though it is found in rather larger quantity in the foal whilst it still lives on milk.

Kreatin (κρεας, flesh).—This substance, which is found in muscle, is a nitrogenous, very weak base, of bitter taste, having the composition expressed by the formula $C_4H_9N_3O_2 + H_2O$. When crystallized from its solution in hot water it forms colourless, oblique, rhombic prisms (fig. 138). Liebig obtained about one ounce of kreatin from 100 lbs. of horse-flesh, and it can easily be obtained from "Liebig's extract of meat". The appearance presented by the crystals is here given.

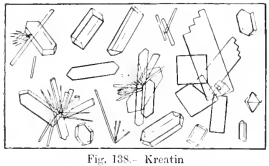

Fig. 138.—Kreatin

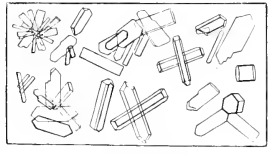

Fig. 139.—Kreatinine

Kreatinine is a strong base having the same composition as kreatin, less one equivalent of water, and its formula is consequently $C_4H_7NO_3$. It is constantly present in the urine, and the crystals present the forms here shown.

Urea Ferment.—Shortly after urine is passed it undergoes decomposition, the urea it contains becoming converted into ammonium carbonate. This change is associated with the appearance of large numbers of a yeast-like micro-organism named the torula or micrococcus ureæ, and is believed to be also due to the presence of an enzyme or ferment in the mucus of the bladder.

MORBID CONDITION OF THE URINE

The tissues of the body are constantly wearing away and being renovated from the nutritive substances contained in the blood, and the blood is at the same time constantly taking into itself the worn-out materials or waste resulting from the wear and tear of the body, some of the more important of which are discharged through the kidneys in the form of urine. Upon the efficiency, therefore, of the latter organs to free the blood from these impurities will largely depend the health of the animal.

The normal urine consists of water carrying in solution certain organic and mineral salts.

In the horse it is a yellowish fluid, having a peculiar odour and an alkaline reaction. Its specific gravity varies more or less according to the nature of the food consumed, work, &c., the average being about

1·042. It is nearly always more or less turbid in appearance, sometimes actually muddy. If healthy urine be allowed to stand, a copious sediment of earthy-looking matter falls to the bottom of the vessel. A small quantity of this placed under the microscope is found to consist of minute crystals of carbonate of lime (fig. 134).

A few drops of nitric acid added to horses' urine decomposes the carbonate of lime and causes the fluid to effervesce, just as when tartaric acid is added to carbonate of soda. As a result of this, the sediment disappears and the urine becomes bright and clear.

In disease the urine is liable to undergo very striking alterations in its physical characters, as well as in its chemical composition, and in these connections it sometimes affords valuable assistance, not only in locating a disorder, but likewise in determining its nature.

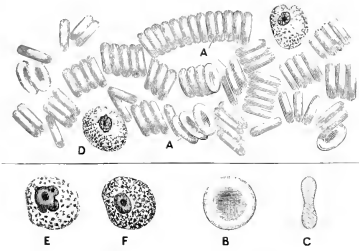

Fig. 140.—Blood Corpuscles and Leucocytes

A A, Red corpuscles. B, Side view of a red corpuscle. C, Red corpuscle seen edgeways. D, E, F, Leucocytes.

Colour.—In a healthy condition the urine presents a bright yellowish hue. When, as is sometimes the case, carbonate of lime is very abundant, the fluid wears a distinctly muddy appearance.

Change of colour as the result of disease may be brought about by various morbid conditions of the urinary and other organs.

In polyuria, or profuse staling, it loses its yellow appearance and becomes pale and watery in appearance, and the same change is observed in debility and in some forms of disease of the kidney.

In all febrile diseases the colour of the urine becomes heightened, with a tendency to assume a reddish yellow appearance. This is most noticeable after standing for a short time, when the carbonate of lime held in suspension has subsided to the bottom of the vessel and the turbidity has cleared off.

Bile imparts to urine a deep brownish-yellow hue, which denotes the existence of liver derangement in one or other of its various forms.

Blood gives to this fluid a red or smoky-red appearance, and denotes disease associated with rupture of blood-vessels either in the kidneys, the bladder, the ureters, or the urethra. Its presence is recognized by

microscopical examination, which reveals the existence of small biconcave discs or red blood corpuscles (fig. 140). (See "Blood".)

Hæmoglobin (fig. 141), the substance contained in the red cells of the blood, is found in the urine in that sudden and fatal disease known as Hæmoglobinuria, and imparts to it the colour of porter. When allowed to stand, the urine in this disease throws down a blackish-brown granular flocculent deposit.

If a few drops of nitric acid be added to a small quantity of the fluid, a dense precipitate of coagulated albumen will be formed, and the same result will follow if the urine be heated in a test-tube over the flame of a spirit-lamp.

Pus (matter) is sometimes found in the urine, and when existing in considerable amount imparts to it an opaque, milky-looking appearance.

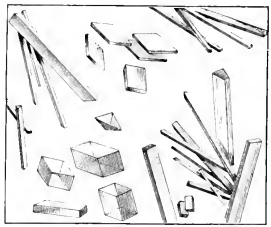

Fig. 141.—Hæmoglobin Crystals from the Blood

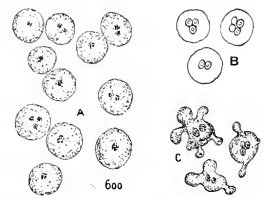

Fig. 142.—Pus

A, Pus cells. B, Pus cells treated with acetic acid, showing nuclei. C, Pus cells "budding".

If a small quantity of the urine be set aside in a glass, and allowed to stand, the pus settles down to the bottom as a creamy-looking sediment. When such a deposit is examined with a microscope it is found to consist of small, pale, nucleated or granular-looking cells (fig. 142).

A few pus corpuscles may be frequently found in the urine of old horses and mares, which in other respects exhibit no signs of disease. They are mostly the result of a slight irritability of the bladder or prostate, uterus or vagina.

When pus exists in quantities sufficient to impart an opaque appearance to the urine, it may be presumed that there exists some active disease in some part of the mucous membrane of the genito-urinary organs, or in the prostate gland, or the kidney. It is mostly derived from the bladder, as the result of irritation excited by a calculus, or from a chronic catarrhal state of the mucous membrane. In abscess of the kidney a large amount of pus is found in the urine.

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